BLM

Copper Flat Copper Mine
Draft
Environmental Impact Statement

Sierra County, New Mexico

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Volume 1
November 2015

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BLM MISSION. . .

To sustain the health, diversity, and productivity of the public land for the use and enjoyment of present and future generations.

BLM/NM/ES-16-02-1793

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Las Cruces District Office
1800 Marquess Street
Las Cruces, New Mexico 88005
www.blm.gov/nm/lascruces

In Reply Refer To:
1793 (L0310)

November 2015

Dear Reader:

Enclosed for your review and comment is the Copper Flat Copper Mine Draft Environmental Impact Statement (EIS) for the Bureau of Land Management (BLM) Las Cruces District Office. This EIS has been prepared by the BLM in accordance with the National Environmental Policy Act of 1969, as amended, and in consultation with several cooperating agencies, including the New Mexico Energy, Minerals, and Natural Resources Department, New Mexico Environment Department, New Mexico Department of Game and Fish, and the New Mexico Office of the State Engineer. The BLM also took into account public comments received during the scoping effort in 2012. The Draft EIS is available for a 45-day comment period following the Environmental Protection Agency's (EPA's) publication of the Notice of Availability in the *Federal Register*.

The New Mexico Copper Corporation (NMCC) proposes reestablishing a poly-metallic mine and processing facility located near Hillsboro, New Mexico. The 2,190-acre project would utilize BLM-managed public land and private property. The Project would provide NMCC access to conduct mining activities in Sierra County on public land, leading to the extraction and processing of copper ore. The Draft EIS and supporting information is available on the project web site at: http://www.blm.gov/nm/copperflateis.

The BLM encourages the public to provide information and comments pertaining to the analysis presented in the Draft EIS. We are particularly interested in feedback concerning the adequacy and accuracy of the proposed action and alternatives, the analysis of their respective management decisions, and any new information that would help the BLM as it develops the plan. In developing the Final EIS, which is the next phase of the planning process, the decision maker may select various management decisions from each of the alternatives analyzed in the Draft EIS for the purpose of creating a mine plan of operation that best meets the needs of the resources and values in this area under the BLM multiple-use and sustained yield mandate. As a member of the public, your timely comments on the Draft EIS will help formulate the Final EIS. Comments will be accepted for 45 calendar days following the EPA publication of its Notice of Availability in the *Federal Register*. The BLM can best utilize your comments and resource information submissions if received within the review period.

Comments may be submitted electronically at: BLM_NM_LCDO_Comments@blm.gov. Comments may also be submitted by mail to: BLM Las Cruces District Office, Attention: Doug Haywood, 1800 Marquess Street, Las Cruces, NM 88005. To facilitate analysis of comments and information submitted, we strongly encourage you to submit comments in an electronic format.

If you wish to submit comments on the Draft EIS, we request that you make your comments as specific as possible. Comments will be more helpful if they include suggested changes, sources, or methodologies, and reference to a section or page number. Comments containing only opinions or preferences will be considered and included as part of the decision making process, however, they will not receive a formal response from the BLM.

Before including your address, phone number, email address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

The BLM will hold public meetings in Hillsboro and Truth or Consequences, New Mexico. Both meetings will be held from 7:00 p.m. to 9:00 p.m. Public meetings to provide an overview of the document, respond to questions, and take public comments will be announced by local media, website, or public mailings at least 15 days in advance.

Copies of the Draft EIS have been sent to affected Federal, State, and local government agencies, Native American Tribes, New Mexico Congressional members and staff, residents of Hillsboro, New Mexico, grazing permittees, and other interested citizens and groups. Copies of the Draft EIS are available for public inspection at the BLM Las Cruces District Office and public libraries in Hillsboro and Truth or Consequences, New Mexico.

Thank you for your continued interest in the Copper Flat Copper Mine EIS. For additional information or clarification regarding this document, please contact *Doug Haywood, Project Lead, BLM Las Cruces District Office at (575) 525-4498 or by email at dhaywood@blm.gov.*

Sincerely,

Bill Childress

Bill Childress
District Manager

1 Enclosure

COPPER FLAT COPPER MINE
DRAFT ENVIRONMENTAL IMPACT STATEMENT

LEAD AGENCY: U.S. Department of the Interior, Bureau of Land Management (BLM)

COOPERATING AGENCIES:
New Mexico Department of Energy, Minerals, and Natural Resources (NMEMNRD), Mining and Minerals Division (MMD)
New Mexico Environment Department (NMED)
New Mexico Department of Game and Fish (NMDGF)
New Mexico Office of the State Engineer (OSE)

FOR FURTHER INFORMATION, CONTACT:

Doug Haywood, Project Manager
BLM Las Cruces District Office
1800 Marquess Street
Las Cruces NM 88005
(575) 525-4498
Email: dhaywood@blm.gov

COMMENTS:

The BLM must receive written comments on the Copper Flat Copper Mine Draft Environmental Impact Statement within 45 days following the date that the U.S. Environmental Protection Agency publishes its Notice of Availability in the *Federal Register*. You may use the following methods for sending comments:

- Email: BLM_NM_LCDO_Comments@blm.gov
- Mail: Bureau of Land Management, Copper Flat Copper Mine Project, Attention: Doug Haywood, Project Manager, 1800 Marquess Street, Las Cruces, NM 88005.

ABSTRACT:

The New Mexico Copper Corporation (NMCC) has submitted to the BLM the Copper Flat Mine Plan of Operations (MPO), dated December 2010 and revised June 2011, for the proposed reestablishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico on BLM-managed public land. The mine was previously owned and operated by Quintana Minerals Corporation (Quintana). Under the Federal Land Policy and Management Act of 1976, as amended, and supported by National Environmental Policy Act analysis, the BLM will decide whether to approve the MPO with modifications, and if so, under what terms and conditions. NMCC's Proposed Action includes an open pit mine, flotation mill, TSF, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. Proposed land reclamation efforts during mine operations and following mine closure would significantly improve an existing brownfield site. The previous Quintana operation worked at a 15,000-ton per day (tpd) rate; the Proposed Action increases that throughput to 17,500 tpd. Additional alternatives are identified for rates of 25,000 tpd and 30,000 tpd. The "No Action" Alternative describes conditions expected to occur if there would be no new mining activity.

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APPENDICES – VOLUME 2 (CD Located on Inside Back Cover)

TABLES:

FIGURES:

ACRONYMS

$\mu g/m^3$	micrograms per liters
AADT	average annual daily traffic
AASHTO	American Association of State Highway and Transportation Officials
ADT	average daily traffic
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACM	asbestos-containing material
AF	acre-feet
AFY	acre-feet per year
AIRFA	American Indian Religious Freedom Act
amsl	above mean sea level
ANFO	ammonium nitrate/fuel oil
APE	area of potential effect
AQCR	Air Quality Control Region
ARD	acid rock drainage
ARPA	Archeological Resources Protection Act
AST	aboveground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
AUM	animal unit month
BACT	best available control technology
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	best management practice
BOR	Bureau of Reclamation
CAS	Chemical Abstract Service
CDP	Census Designated Place
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
cm	centimeters
CO	carbon monoxide
CO_2	carbon dioxide
CYL	cattle yearlong
dB	decibels
dBA	A-weighted decibels
DHHS	U.S. Department of Health and Human Services

DNL	Day-night Sound Level
DOT	U.S. Department of Transportation
DP	discharge permit
DPS	distinct population segment
EA	Environmental Assessment
EAR	Environmental Assessment Report
EE	Environmental Evaluation
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EPE	El Paso Electric
EO	Executive Order
ESA	Endangered Species Act
ESAL	Equivalent Single Axel Loads
ET	evapotranspiration
FA	financial assurance
°F	Fahrenheit (degrees)
FLPMA	Federal Land Policy and Management Act
FMP	Facilities Master Plan
FR	Federal Register
ft^3	cubic feet
FY	fiscal year
GHB	General Head Boundary
GHG	greenhouse gas
gpm	gallons per minute
GRT	gross receipts tax
GWh	gigawatt hours
HDPE	high-density polyethylene
HHPS	human health and public safety
HP	horsepower
IM	isolated manifestation
IMPLAN	Impact Analysis for Planning
IPCC	U.N. Intergovernmental Panel on Climate Change
IRB	Industrial Revenue Bonds
ISO	Internal Organization for Standardization
JSAI	John Shomaker and Associates Inc.
KOP	key observation point
kV	kilovolt
kW	kilowatt
kWh	kilowatt hours
LCDO	BLM Las Cruces District Office
Leq	Equivalent Sound Level

LOS	level of service
MACT	maximum achievable control technology
mg	milligrams
mg/l	milligram per liter
mg/m^3	milligrams per cubic meter
MIBC	methyl isobutyl carbinol
MIW	mining influenced water
MMD	Mining and Minerals Division
MMPA	mining and mineral processing area
MORP	Mine Operation and Reclamation Plan
MP	mile post
MPO	Mine Plan of Operations
MOU	Memorandum of Understanding
MSDS	Materials Safety Data Sheet
MSHA	Mine Safety and Health Administration
MSL	mean sea level
MVA	mega volt amp
MW	megawatt
MWh	megawatt hours
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NATA	National Air Toxics Assessment
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NIOSH	National Institute for Occupational Safety and Health
NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
NMCC	New Mexico Copper Corporation
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMEMNRD	New Mexico Energy, Minerals, and Natural Resources Department
NMSA	New Mexico Spaceport Authority
NMWRRS	New Mexico Water Rights Reporting System
NNSR	Nonattainment New Source Review
NPDES	National Pollutant Discharge Elimination System
NO2	nitrogen dioxide
NO_x	nitrous oxide
NOAA	National Oceanic and Atmospheric Administration

NORM	naturally occurring radioactive materials
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NWR	National Wildlife Refuge
O_3	ozone
OHV	off-highway vehicle
OPI	other property income
OSHA	Occupational Safety and Health Administration
OSE	Office of the State Engineer
OSM	Office of Surface Mining
PA	programmatic agreement
PAP	permit application package
PCI	pavement condition index
pCi/L	picocurie per liter
PCPI	per capita personal income
PILT	payment in lieu of taxes
$PM_{2.5}$	fine particles
PM_{10}	particles matter
PMP	probable maximum precipitation
ppb	parts per billion
ppm	parts per million
PPV	peak particle velocity
PSD	prevention of significant deterioration
RCRA	Resource Conservation and Recovery Act
RD	Ranger Districts
RFRA	Religious Freedom Restoration Act
ROC	Region of Comparison
ROD	Record of Decision
ROI	Region of Influence
ROW	right-of-way
RMP	Resource Management Plan
SAG	semiautogenous
SARA	Superfund Amendments and Reauthorization Act
SCP	spill contingency plan
SGCN	species of greatest conservation need
SHPO	State Historic Preservation Office
SMIO	State Mine Inspector's Office
SO_2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures Plan
SRCP	State Register of Cultural Properties

SWPPP	Stormwater Pollution Prevention Act
SX-EW	solvent extraction and electrowinning
TDS	total dissolved solids
TENORM	technologically enhanced naturally occurring radioactive materials
THEMAC	THEMAC Resources Group, Ltd.
TIMS	Transportation Information Management System
tpd	tons per day
tpy	tons per year
TSF	tailings storage facility
TSP	Total Suspended Particulate
UN	United Nations
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
VFD	volunteer fire departments
VRI	visual resource inventory
VRM	Visual Resource Management
WRDF	waste rock disposal facility
yd^3	cubic yard

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

INTRODUCTION

The Bureau of Land Management (BLM) has prepared the Copper Flat Copper Mine Draft Environmental Impact Statement (EIS) to assess the proposed reestablishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico, previously owned and operated by Quintana Minerals Corporation (Quintana Minerals). The BLM manages surface ownership of 56 percent of the Copper Flat site and 44 percent is privately-owned. The mineral interest of the mining proponent, New Mexico Copper Corporation (NMCC), in the Copper Flat mine includes 26 patented mining claims and 231 unpatented mining claims, (202 lode claims and 29 placer claims), 9 unpatented millsites, and 16 fee land parcels in contiguous and noncontiguous land parcels and claim blocks. The BLM also manages substantial mineral ownership in the vicinity of the Copper Flat project.

This analysis has been carried out to meet the requirements of the National Environmental Policy Act (NEPA). This Draft EIS evaluates four alternatives: a No Action Alternative, the Proposed Action, and two action alternatives that include variations of the ore production rate. The EIS has been prepared to: 1) analyze the environmental impacts of alternatives that would meet the proposed purpose and need; and 2) assist the BLM in deciding whether to approve a Preferred Alternative that may be the Proposed Action, an identified alternative, or a combination of analyzed elements of the Proposed Action or alternatives.

The Draft EIS has been prepared in accordance with NEPA requirements for the BLM and a Record of Decision (ROD) will be signed. If the Preferred Alternative identified in the ROD differs from the Mine Plan of Operations (MPO), the MPO must be revised by NMCC and approved by the BLM prior to commencing mining operations. The Draft EIS evaluates the potential physical, biological, economic, and social consequences that would likely result from implementing each alternative.

The BLM has signed Memoranda of Understanding (MOUs) with NMCC, and with State agencies including the New Mexico Energy, Minerals, and Natural Resources Department (NMEMNRD) Mining and Minerals Division (MMD), the New Mexico Environment Department (NMED), the New Mexico Department of Game and Fish (NMDGF), and the New Mexico Office of the State Engineer (OSE). The MOUs identify the roles and responsibilities of each of the cooperating parties in developing the EIS and executing related State permitting processes. Each MOU formally designates MMD, the NMED, OSE, and NMDGF as cooperating agencies in the EIS. As such, these agencies share information and analyses, raise appropriate concerns, and assist with review of internal draft documents.

PUBLIC INVOLVEMENT

On January 9, 2012, the BLM Las Cruces District Office (LCDO) published a Notice of Intent in the Federal Register (vol. 77, no. 5, pp. 1080-1081, Doc 2012-128) to prepare an EIS for this project in compliance with NEPA and the Council on Environmental Quality’s regulations for implementing NEPA (40 CFR 1500–1508). Exploration and mining activities on BLM-administered land are controlled by the Secretary of the Interior’s regulations contained in 43 CFR 3715 and 3809. These regulations require mining operations to apply for a permit to use public land for activities that are reasonably incidental to mining, to prevent unnecessary or undue degradation of the land, and to reclaim disturbed areas.

Pursuant to NEPA Section 102(2) (c), the EIS will provide agencies and the public with a general understanding of the proposed Copper Flat mine project by evaluating the environmental impacts of the proposed MPO. The EIS will also evaluate alternatives to the proposed MPO. The purpose of this evaluation is to determine whether to approve the plan as proposed, or to require additional mitigation measures to minimize impacts to the environment, in accordance with BLM regulations.

External Scoping

Two public meetings were held during the scoping period, which began January 9, 2012 and ended March 9, 2012. Media advertisements notified the public that scoping meetings would be held in Hillsboro and Truth or Consequences, New Mexico on February 22 and 23, 2012, respectively. Public participants at the meetings numbered 59 in Hillsboro and 72 in Truth or Consequences. The open house portion of the meeting was used to encourage discussion and information sharing and to ensure that the public had opportunities to speak with representatives of the BLM's LCDO, the State of New Mexico, and NMCC. Several display stations with exhibits, maps, and other informational materials were staffed by representatives of the BLM LCDO, MMD, the NMED, NMCC, and Solv (EIS contractor). The BLM and NMCC provided fact sheets and informational materials at the meetings. In addition to the scoping meetings, the BLM solicited comments through use of scoping letters, a website, a toll-free telephone number, and an email address.

Issues Identified in Scoping

The key issues identified during the public scoping process focused on water, biological resources, traffic, and social and economic concerns. The four topics that received the highest number of comments related to resource issues are briefly summarized below.

Socioeconomics: Fifty-nine commenters provided 266 comments concerning socioeconomics. The comments addressed the current state of Sierra County's economy and the pressing need for jobs and increased tax revenue. Some commenters suggested using the mine as a source of tourism. Other commenters expressed concerns that the presence of the mine and mining operations might negatively impact current tourism revenue that depends on the quality of the environment and surface water recreation. Several commenters requested information on how the community might be compensated for potential problems associated with mining, such as loss of land use and water (both quality and quantity). Information was also requested on how loss of land and water use might affect the economy. Some commenters stated that the mine would be an economic opportunity and there may not be other economic opportunities as large in the area in the future.

Groundwater: Forty commenters provided 168 comments about groundwater. Commenters expressed concern that mining activities might either reduce available groundwater or pollute groundwater, which in turn would affect the community and environment. Concern was also expressed about the development of a cone of depression if mining operations pull water from the aquifer, and how this would affect wells, surface water, and wildlife. Some commenters questioned water use during droughts and water conservation practices in general to maintain groundwater.

Water Quantity: Thirty-six commenters provided 146 comments concerned with water quantity. Commenters expressed concern that the water use of the mine coupled with potential water pollution would affect the amount of safe drinking water available to the people, agriculture, plants, and wildlife of Sierra County. Several commenters asked how they can be assured that the amount of water proposed to be used would not affect the amount of water available for other uses or permanently deplete the aquifer.

Surface Water: Twenty-nine commenters provided 98 comments concerned with surface water, which mainly focused on water quantity and water quality. Commenters expressed concern that mining operations would reduce stream levels and pollute surface water areas, which can affect wildlife, plants,

and livestock operations. Commenters expressed concern that the aquifer would be permanently affected by mining activities and that this drawdown would affect surface water over the long term.
These key issues were considered in an alternatives development session attended by the BLM, cooperating agencies, and the third-party EIS contractor and were then incorporated into the following impact questions used to develop the alternatives to the Proposed Action:

- How would groundwater withdrawal affect surface ecosystems and other users?
- How would mining activities impact surface water and groundwater quality for present or foreseeable future use?
- How would mining activities use water efficiently?
- How would mining activities directly or indirectly affect wildlife species, their habitat, and their behavior?
- How would the mine affect public services, health and safety, and local economies?

PURPOSE AND NEED STATEMENT

The purpose of the BLM in relation to the proposed project is to manage the mineral resource within the Copper Flat mine to best meet the present and future needs of the American people in a balanced manner and to take into account the long-term sustainability of other resources and resource uses.

The need for the BLM to authorize this project is established under the General Mining Law of 1872, as amended. Under this law, persons are entitled to reasonable access to explore for and develop mineral deposits on public domain land. As the Federal agency responsible for managing mineral rights and access on certain Federal land, the BLM must ensure that NMCC's proposal complies with BLM Surface Management Regulation (43 CFR 3809), the Mining and Mineral Policy Act of 1979 (as amended), and Federal Land Policy and Management Act of 1976.

PROPOSED ACTION AND ALTERNATIVES

Proposed Action

The Proposed Action would consist of an open pit mine, flotation mill, TSF, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. The Proposed Action was intentionally developed to reuse the existing foundations, production wells, and water pipeline that were employed by the previous Quintana operation. Reuse of this infrastructure would allow mine planners to limit the impact of the proposed mine. Proposed land reclamation efforts during mine operations and following mine closure would result in significant improvement to an existing brownfield site.

The previous Quintana operation produced ore at a 15,000-ton per day (tpd) rate; the alternative defined as the Proposed Action proposes to increase that throughput to 17,500 tpd to increase efficiency. The Proposed Action also varies from some of the other original Quintana mine plant elements to increase efficiency and improve the performance of mine infrastructure. NMCC's Proposed Action includes a lined tailings storage facility (TSF) to increase water recycling and meet new regulation standards in New Mexico. The proposed lined TSF would be a substantial upgrade from the unlined TSF previously employed at the site.

In 2011, NMCC submitted an MPO that was based on the resource information and engineering studies available at the time. The current Proposed Action was deemed feasible and appropriate for the initiation of the EIS evaluations by the BLM. Subsequent engineering studies and exploration drilling have been completed to inform the EIS process. THEMAC Resources Group Limited (THEMAC), parent organization of NMCC, carried out a series of exploration activities at Copper Flat between 2009 and 2012 in order to confirm, characterize, and expand the Copper Flat mineral deposit. THEMAC's exploration program was comprised of drilling, geologic mapping, geophysical surveys, and sampling for mineral content, metallurgical testing, geochemical characterization, and geotechnical analysis. During this period, THEMAC completed 47,500 feet of drilling in 48 drill holes. No exploration activities have taken place at Copper Flat since completion of the 2012 program.

The Proposed Action was analyzed to adequately reflect the largest possible impact of the proposed mining footprint at Copper Flat. At the conclusion of the EIS process, the MPO would be revised to accurately represent the Preferred Alternative selected by the BLM for the ROD.

Alternative 1

In 2011 and 2012, NMCC performed a preliminary feasibility study to further develop internal engineering plans for the Copper Flat mine. In addition, an expanded resource exploration program was launched at Copper Flat to better define the ore body. The result of these two efforts was a revised plan of development for Copper Flat based on new more detailed information about the ore body and the engineering studies. NMCC's preliminary feasibility study for Copper Flat maintained the same locations indicated in the Proposed Action for the proposed mine pit, processing area, and TSF, but refined the process to reflect better engineering data, increase the mine efficiency, and improve project economics. Overall, this alternative (Alternative 1 or the Accelerated Operations Alternative) to the Proposed Action would have the same general scale and scope of operation, with differences mostly attributed to higher process rates to improve project viability, and some increases in efficiency. Table ES-1 summarizes the differences between the Proposed Action and Alternative 1.

Alternative 2

In 2013, NMCC advanced their mine plans by conducting a definitive feasibility study, which refines the preliminary feasibility study, to further fine-tune the internal plan of development for the Copper Flat mine. This study applied a more detailed approach to evaluating the mine processing circuit and overall initiative. The definitive feasibility study found that the mine would be more efficient with an increase to the TSF capacity and an increase to the annual ore processing rate. Alternative 2, as defined in this EIS, is based on the definitive feasibility study for Copper Flat and has a TSF that fits in the same footprint as the Proposed Action but has a larger volume for storage. Alternative 2, as defined in the EIS, has a 30,000 tpd plan with a 12-year mine life, but remains within the mine area evaluated under the Proposed Action.

In accordance with the requirements stated in 40 CFR 1500-1508, the BLM has designated Alternative 2 as the Preferred Alternative. This alternative has the same general scale and scope of the Proposed Action but proposes to process 25 million tons of ore more than the Proposed Action and Alternative 1. The other main differences are derived from an increase in the process rate to improve project economics and increases in efficiency where possible. Table ES-2 briefly summarizes the differences between the Proposed Action and Alternative 2.

Table ES-1. Summary of Differences Between Proposed Action and Alternative 1

Table ES-1. Summary of Differences Between Proposed Action and Alternative 1	
No Change from Proposed Action	**Changes From Proposed Action**
• General scale and scope of the operation • Total ore tons processed • Mining process o Open pit o Drill, blast, loader, truck o Type of equipment used • Mineral beneficiation process o Crush, grind, sulfide flotation, concentrate filtering o Type of equipment used • Tailings storage o Conventional slurry o Raised TSF o Centerline construction with tailings sand o Fully lined o Monitoring systems • Type of mine & process equipment used • Two final products o Copper concentrate with gold & silver o Molybdenum concentrate • Concentrate handling, shipping methods, shipping route, destination • Operating schedule (24 x 7) • Size of the mine area • Location and siting of the proposed facilities • Reuse of existing infrastructure and site grading • Reuse of existing diversion structures • Ongoing exploration • Concurrent reclamation practices • Reclamation standards and methods (with updates to new regulations) • Planned water conservation activities standard aspect of operating plan • Water source, storage, and delivery/distribution systems • Surface and groundwater protection methods • Standards for groundwater monitoring around facilities • Power source, transmission, and distribution systems • Growth media borrow and storage plans • Fencing and exclusionary devices • General viewshed • Construction workforce required • Mine workforce required • Construction and mine workforce skill requirements • No heap leach • No on-site smelting/refining • No placer mining	• Process rate increased to nominal 25,000 tpd to improve project economics • Mine life shortened to 11 years due to higher process rate • Whole tailings thickener removed from tailings flowsheet in order to improve TSF stability • Non process water use decreases due to more efficient designs • Annual water use increases due to higher process rate • Duration of water use decreases due to higher process rate • Total water use over life of mine increases slightly due to higher process rate • Total disturbance footprint reduced due to more efficient design • Number and disturbance footprint of rock storage piles reduced due to more efficient design • Power requirements increase due to increased process rate • Concentrate loads trucked on NM-152 and US I-25 increase due to higher process rate

Table ES-2. Summary of Differences Between Proposed Action and Alternative 2

<table>
<tr><th colspan="2">Table ES-2. Summary of Differences Between Proposed Action and Alternative 2</th></tr>
<tr><th>No Change from Proposed Action</th><th>Changes From Proposed Action</th></tr>
<tr><td>
• General scale and scope of the operation
• Mining process
  o Open pit
  o Drill, blast, loader, truck
  o Type of equipment used
• Mineral beneficiation process
  o Crush, grind, sulfide flotation, concentrate filtering
  o Type of equipment used
• Tailings storage
  o Conventional slurry
  o Raised TSF
  o Centerline construction with tails sand
  o Fully lined
  o Monitoring systems
• Type of mine & process equipment used
• Two final products
  o Copper concentrate with gold & silver
  o Molybdenum concentrate
• Concentrate handling, shipping methods, shipping route, destination
• Operating schedule (24 x 7)
• Size of the mine area
• Location and siting of the proposed facilities
• Reuse of existing infrastructure and site grading
• Reuse of existing diversion structures
• Ongoing exploration
• Concurrent reclamation practices
• Reclamation standards and methods (with updates to new regulations)
• Planned water conservation activities standard aspect of operating plan
• Water source, storage, and delivery/distribution systems
• Surface and groundwater protection methods
• Standards for groundwater monitoring around facilities
• Power, transmission, and distribution systems
• Growth media borrow and storage plans
• Fencing and exclusionary devices
• General viewshed
• Construction workforce required
• Construction and mine workforce skill requirements
• No heap leach
• No on-site smelting/refining
• No placer mining
</td><td>
• Process rate increased to nominal 30,000 tpd to further improve project economics to meet minimum finance requirements
• Total life of mine tons processed increased 25 million tons due to exploration success
• Mine life shortened to 11 years due to higher process rate
• Whole tailings thickener removed from tailings flowsheet in order to improve TSF stability
• Non process water use decreases due to more efficient designs
• Annual water use increases due to higher process rate
• Duration of water use decreases due to higher process rate
• Total water use over life of mine increases slightly due to higher process rate
• Total disturbance footprint reduced due to more efficient designs
• Number and disturbance footprint of rock storage piles reduced due to more efficient design
• Power requirements increase due to increased process rate
• Alternate power source selected
• Concentrate loads trucked on NM-152 and US I-25 increase due to higher process rate
• Mine workforce increases due to increased process rate
• A package wastewater treatment plan proposed instead of septic tanks and leach field
• Reclamation & closure: Buried pipelines and electrical conduits would be removed
</td></tr>
</table>

No Action Alternative

NEPA requires consideration of a "no action" alternative. Under the No Action Alternative, the project would not be constructed and NMCC's proposed open pit mining operations would not occur. The environmental, social, and economic conditions described as the affected environment would not be affected by the construction, operation, reclamation, or closure of the mine. Local employment and economic revenue would not increase as a result of this alternative. Existing uses such as grazing and recreation would continue at current levels. The mine area would be reclaimed according to BLM standards, and to NMED requirements pertaining to disturbances associated with site exploration.

Alternatives Eliminated from Further Consideration

A number of alternatives suggested during scoping have been considered and eliminated from detailed study. These alternatives were evaluated using the following criteria to determine if further review was necessary. According to the BLM NEPA Handbook, an action alternative can be eliminated from detailed analysis if:

- It is ineffective (it would not respond to the purpose and need).
- It is technically or economically infeasible (consider whether implementation of the alternative is likely given past and current practice and technology; this does not require cost-benefit analysis or speculation about an applicant's costs and profits).
- It is inconsistent with the basic policy objectives for the management of the area (such as, not in conformance with the land use plan).
- Its implementation is remote or speculative.
- It is substantially similar in design to an alternative that is analyzed.
- It would have substantially similar effects to an alternative that is analyzed.

Based upon these criteria, the following alternatives were considered but eliminated from further study.

Dry Stack Tailings Disposal

Dry stack tailings disposal was initially considered as an alternative to the conventional method proposed in order to achieve the following potential benefits:

- Reduction of water consumption;
- Avoidance of the permitting, construction, and operation of a tailings dam regulated by the OSE;
- Allowance for concurrent reclamation to reduce erosion of stored tailings and mitigate the visual impact of the TSF; and
- Potential reduction of the footprint area of the TSF.

Tailings Thickener Alternatives

Another set of alternatives that was considered was the use of tailings thickeners at various stages in the tailings storage process to enhance water conservation.

The Copper Flat TSF water balance model has water inputs from the tailing overflow and underflow, direct precipitation within the TSF limits, and precipitation run-on from undiverted upgradient areas. The model has water losses of evaporation from the supernatant pond, the tailings beach, the sand embankment areas, and water locked up or entrained within the tailings mass. Of these losses, the most significant is the water locked up or entrained within the tailings mass.

Additional water conservation can be achieved by reducing the volume of water loss due to lock-up. Water loss due to lock-up is a function of the density and saturation of the tailings mass. By increasing the density of the tailings, the volume of water loss is reduced, assuming no change in tailings saturation. One method of achieving an increase in the tailings density is to thicken the slurry being deposited. All of these thickened tailings alternatives were eliminated from further consideration because they would be at a level of a return on investment that would be considered economically infeasible.

ENVIRONMENTAL CONSEQUENCES

Table ES-3 presents the assessed impacts associated with the Proposed Action and each alternative for each resource area. A more complete description of the impacts is provided in Chapter 3.

Table ES-3. Summary of Impacts

Table ES-3. Summary of Impacts			
Resource Area	**Proposed Action**	**Alternative 1**	**Alternative 2 (Preferred Alternative)**
Air Quality	Not Significant	Not Significant	Not Significant
Climate Change and Sustainability	Not Significant	Not Significant	Not Significant
Water Quality	Not Significant	Not Significant	Not Significant
Surface Water Use	Significant	Significant	Significant
Groundwater Resources	Significant	Significant	Significant
Mineral and Geologic Resources	Significant	Significant	Significant
Soils	Significant	Significant	Significant
Hazardous Materials and Solid Waste/Solid Waste Disposal	Not Significant	Not Significant	Not Significant
Wildlife and Migratory Birds	Not Significant	Not Significant	Not Significant
Vegetation, Invasive Species, and Wetlands	Significant	Significant	Significant
Threatened and Endangered Species/Special Status Species	Not Significant	Not Significant	Not Significant
Cultural Resources	Significant	Significant	Significant
Visual Resources	Significant	Significant	Significant
Land Ownership and Land Use	Not Significant	Not Significant	Not Significant
Recreation	Not Significant	Not Significant	Not Significant
Special Management Areas	Not Significant	Not Significant	Not Significant
Lands and Realty	Not Significant	Not Significant	Not Significant
Range and Livestock	Significant	Significant	Significant
Transportation and Traffic	Significant	Significant	Significant
Noise and Vibrations	Not Significant	Not Significant	Not Significant
Socioeconomics	Significant	Significant	Significant
Environmental Justice	Significant	Significant	Significant
Human Health and Public Safety	Not Significant	Not Significant	Not Significant
Utilities and Infrastructure	Not Significant	Not Significant	Not Significant
Paleontology	Not Significant	Not Significant	Not Significant

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CHAPTER 1

INTRODUCTION

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CHAPTER 1. INTRODUCTION

1.1 PURPOSE AND NEED

1.1.1 Background

The primary source for the Proposed Action is the Copper Flat Mine Plan of Operations (MPO), dated December 2010 and revised June 2011. As the project has evolved, additional or revised information has been developed to more accurately describe the Proposed Action and correct errors in the original MPO document. The technically feasible elements within the Proposed Action as well as the scale and intent of the Proposed Action have remained unchanged. Alternatives to the Proposed Action include some engineering solutions that were developed after the MPO was accepted for evaluation. Throughout this Environmental Impact Statement (EIS), information referenced using the term “Proposed Action” is equivalent to information contained in the MPO, as modified to correct errors.

The Copper Flat project is the proposed reestablishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico, previously owned and operated by Quintana Minerals Corporation (Quintana Minerals). The Bureau of Land Management (BLM) manages surface ownership of 56 percent of the Copper Flat site and 44 percent is privately-owned. The mineral interest of the mining proponent, New Mexico Copper Corporation (NMCC), in the Copper Flat mine includes 26 patented mining claims and 231 unpatented mining claims, (202 lode claims and 29 placer claims), 9 unpatented millsites, and 16 fee land parcels in contiguous and noncontiguous land parcels and claim blocks. The BLM also manages substantial mineral ownership in the vicinity of the Copper Flat project. (See Figure 1-1.)

The Proposed Action would consist of an open pit mine, flotation mill, TSF, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. The Proposed Action was intentionally developed to reuse the existing foundations, production wells, and water pipeline that were employed by the previous Quintana operation. Reuse of this infrastructure would allow mine planners to limit the impact of the proposed mine. Proposed land reclamation efforts during mine operations and following mine closure would result in significant improvement to an existing brownfield site.

The previous Quintana operation worked at a 15,000-ton per day (tpd) rate; the alternative defined as the Proposed Action proposes to increase that throughput to 17,500 tpd to increase efficiency. The Proposed Action also varies from some of the other original Quintana mine plant elements to increase efficiency and improve the performance of mine infrastructure. The NMCC Proposed Action includes a lined tailings storage facility (TSF) to increase water recycling and meet new regulation standards in New Mexico. The proposed lined TSF would be a substantial upgrade from the unlined TSF previously employed at the site.

The 2011 MPO was based on the resource information and engineering studies available at that time. The currently Proposed Action alternative was deemed feasible and appropriate for the initiation of the EIS evaluations by the BLM. Subsequent engineering studies and exploration drilling have been completed to inform the EIS process. THEMAC Resources Group Limited (THEMAC) carried out a series of exploration activities at Copper Flat during the years 2009 to 2012 in order to confirm, characterize, and expand the Copper Flat mineral deposit. THEMAC’s exploration program was comprised of drilling, geologic mapping, geophysical surveys, and sampling for mineral content, metallurgical testing, geochemical characterization and geotechnical analysis. During this period, THEMAC completed 47,500 feet of drilling in 48 drill holes (THEMAC 2013b). No exploration activities at Copper Flat have taken place after completion of the 2012 program.

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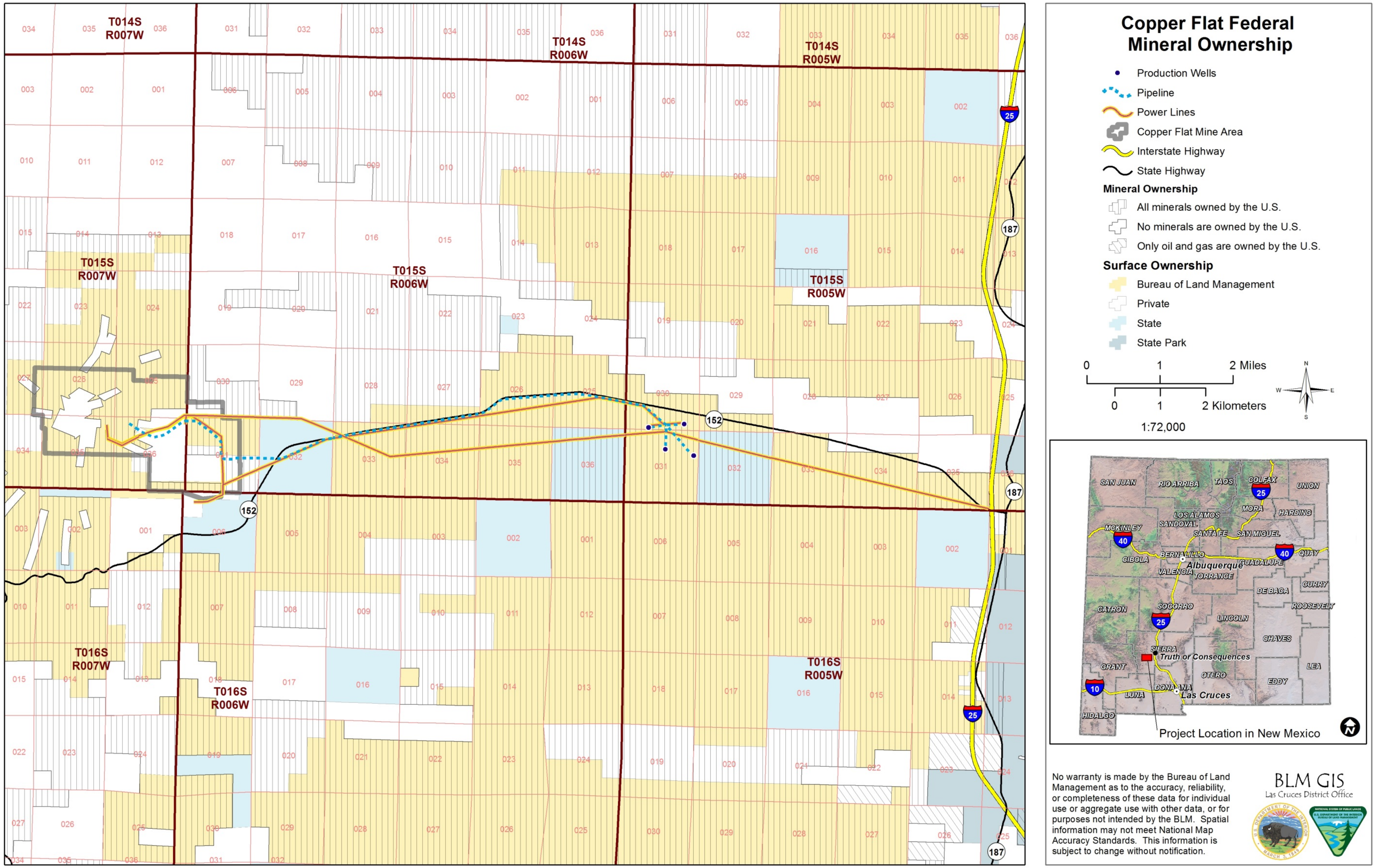
Figure 1-1. Copper Flat Federal Mineral Ownership



Source: BLM 2015.

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The Proposed Action was analyzed to adequately reflect the largest possible impact of the proposed mining footprint at Copper Flat. At the conclusion of the EIS process, the MPO would be revised to accurately represent the Preferred Alternative selected by the BLM for the Record of Decision (ROD).

1.1.2 Agency Purpose and Need

The purpose of the BLM in relation to the proposed project is to manage the mineral resource in the Copper Flat mine to best meet the present and future needs of the American people in a balanced manner and to take into account the long-term sustainability of other resources and resource uses.

The need for the BLM to authorize this project is established under the General Mining Law of 1872, as amended. Under the law, persons are entitled to reasonable access to explore for and develop mineral deposits on public domain land. As the Federal agency responsible for managing mineral rights and access on certain Federal land, the BLM must ensure that NMCC's proposal complies with BLM Surface Management Regulation (43 CFR 3809), the Mining and Mineral Policy Act of 1979 (as amended), and Federal Land Policy and Management Act of 1976.

1.2 DECISION TO BE MADE

1.2.1 The Bureau of Land Management

In conformance with the agency need described in Section 1.1.2, the BLM must review the proposed MPO and determine if it can be implemented in a manner that would prevent unnecessary or undue degradation of public land by operations authorized by the mining laws. The BLM may disapprove an MPO when it: 1) does not meet content requirements as described in 43 CFR 3809.401; 2) proposes operations in an area withdrawn from the mining laws; or 3) proposes operations that would result in unnecessary or undue degradation of public land.

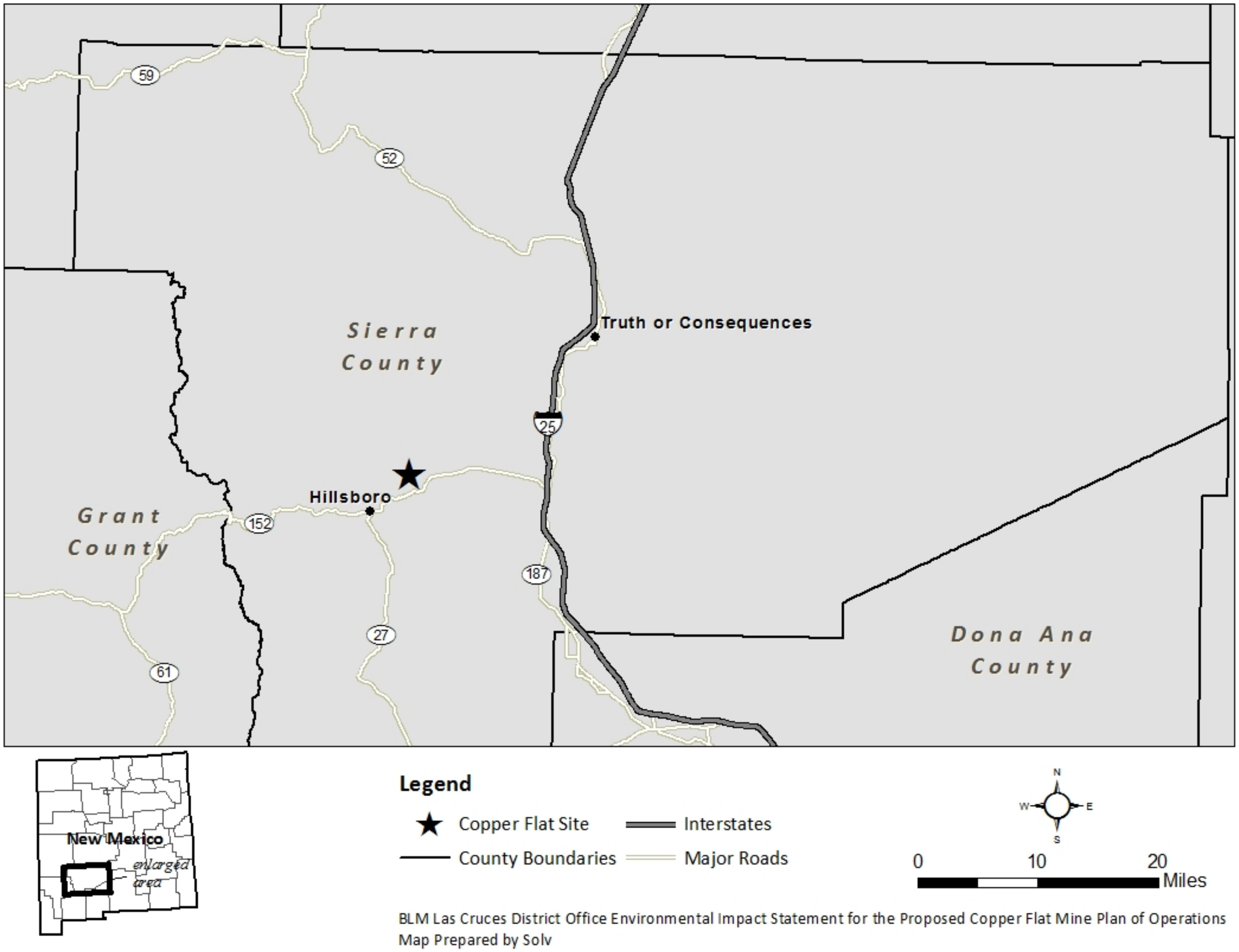
This EIS has been prepared to identify potential environmental effects that would result from implementing the Proposed Action. Reasonable alternatives to the Proposed Action have been developed and are also identified in Chapter 2.

With its final decision, the BLM will identify and approve a Preferred Alternative that may be the Proposed Action, an identified alternative, or a combination of analyzed elements of the Proposed Action or alternatives. A ROD will be signed. If the Preferred Alternative identified in the ROD differs from the MPO, the MPO must be revised by NMCC and approved by the BLM prior to commencing mining operations.

1.3 GENERAL LOCATION

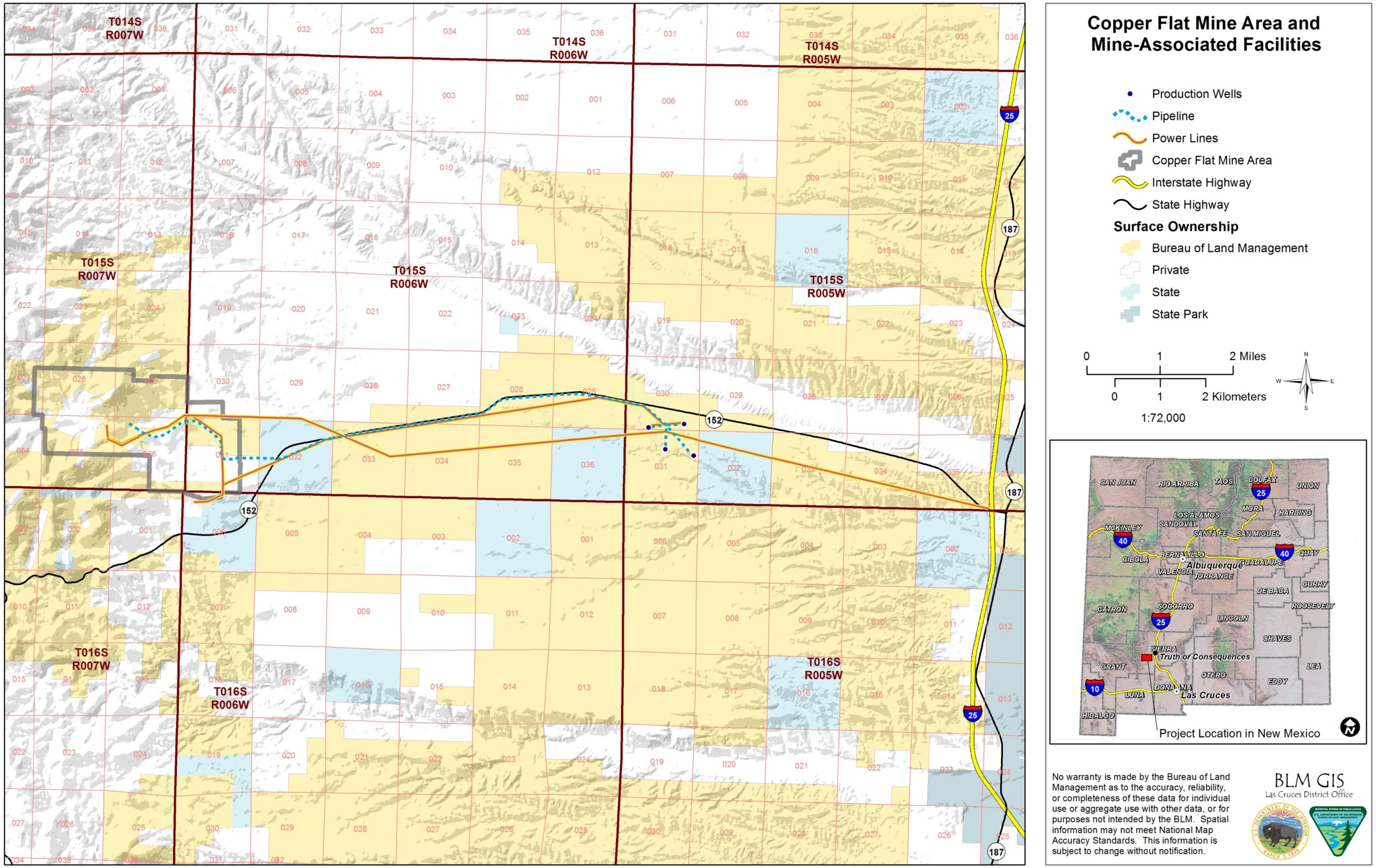
The project is located in Sierra County, New Mexico, approximately 20 miles southwest of Truth or Consequences and 4 miles northeast of Hillsboro. (See Figure 1-2.) The general area can be reached by traveling south 15 miles from Truth or Consequences on Interstate Highway 25 (I-25), then 12 miles west on New Mexico Highway 152 (NM-152). The mine area lies 2 miles west-northwest from NM-152 (THEMAC 2011). (See Figure 1-3.)

Figure 1-2. Copper Flat Vicinity Map



Source: ESRI 2010; NMCC 2012c.

Figure 1-3. Copper Flat Mine Area and Mine Associated Facilities



Source: BLM 2015.

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Legal Description of Proposed Mine area, including Ancillary Facilities:

New Mexico Principal Meridian, New Mexico
T. 15 S., R. 5 W.,
secs. 30 and 31.
T. 15 S., R. 6 W.,
secs. 25, 26, 27, and secs. 30 thru 34.
T. 16 S., R. 6 W.,
sec. 6.
T. 15 S., R. 7 W.,
secs. 25, 26, 27, 35, and 36.

1.4 MAJOR AUTHORIZING LAWS AND REGULATIONS

As previously stated in Section 1.1.2, the BLM would authorize this project under the General Mining Law of 1872, as amended. This authorization is a major Federal action and compliance with the National Environmental Policy Act of 1969 (NEPA) requires an environmental analysis with public disclosure. The BLM may decide to approve the MPO for the Copper Flat mine as submitted, approve (an) alternative(s) to the MPO to mitigate environmental impacts, approve the MPO with stipulations to mitigate environmental impacts, or deny approval for the MPO (no action). If the BLM denies approval for the MPO, the applicant has the right to modify and resubmit the MPO to address issues or concerns identified by the BLM on the original MPO.

The BLM must also ensure that the proponent's proposal complies with BLM Surface Management Regulation (43 CFR 3809), the Mining and Mineral Policy Act of 1970 (as amended), Use and Occupancy under the Mining Laws (43 CFR 3715), and Federal Land Policy and Management Act of 1976.

1.5 RELATIONSHIP TO POLICIES, PLANS, AND PROGRAMS

1.5.1 BLM Policies, Plans, and Programs

The Copper Flat MPO has been reviewed for compliance with BLM policies, plans, and programs. The proposal described in the MPO conforms to the general management guidance for locatable minerals cited below and specific locatable minerals decisions contained in the ROD for the White Sands Resource Management Plan, approved in September 1986 (BLM 1986).

> *"Under the Mining Law of 1872, a person has the right to explore, develop, and produce minerals on public land. Unlike the management of leasable and saleable minerals where BLM has the authority to approve mining operations, locatable mineral activities are regulated by BLM only to prevent unnecessary or undue degradation of the lands."*

1.5.2 Non-BLM Policies, Plans, and Programs

Four New Mexico State agencies, the New Mexico Energy, Minerals, and Natural Resources Department (NMEMNRD), the New Mexico Environment Department (NMED), the New Mexico Department of Game and Fish (NMDGF), and the New Mexico Office of the State Engineer (OSE), were all requested to participate as cooperating agencies in the development of this EIS. Through the participation of these agencies, as well as the parallel review process for the State permitting processes described in the next section, the compliance of the MPO was reviewed against applicable New Mexico State policies, plans, and programs. From the perspective of compliance with New Mexico State policies, plans, and programs, the Environmental Evaluation (EE), described in Section 1.6.2.1.2, and the EIS are regarded as functionally equivalent documents by the State of New Mexico.

1.6 PERMITS, LICENSES, AND OTHER ENTITLEMENTS

1.6.1 Federal Permits, Approvals, and Consultations

A NEPA review of the proposed project was initiated in 1994 when Alta Gold Company (Alta) notified the BLM Las Cruces District Office (LCDO) that the company had purchased the project from Gold Express and was assuming legal responsibility for the MPO initially submitted in 1991. The BLM then began the process of preparing an EIS. The draft EIS was completed in 1996 and the preliminary final EIS was completed in 1999. However, neither a final EIS nor a ROD was issued for the project as a result of Alta's bankruptcy in 1999 (THEMAC 2011).

Consultation with the U.S. Fish and Wildlife Service (USFWS), in accordance with Section 7(c) of the Endangered Species Act (ESA), is required to ensure that any action authorized, funded, or carried out by a Federal agency would not adversely affect a Federally listed threatened or endangered species (THEMAC 2011).

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take into account the effect of their undertakings on historic properties. The Advisory Council on Historic Preservation (ACHP) regulations that implement Section 106 (36 CFR Part 800) describe the process for identifying and evaluating resources; assessing effects of Federal actions on historic properties; and consulting to avoid, minimize, or mitigate those adverse effects. The NHPA does not mandate preservation of historic properties, but it does ensure that Federal agency decisions concerning the treatment of these resources result from meaningful consideration of cultural and historic values, and identification of options available to protect the resources. The BLM has executed a Programmatic Agreement (PA) with the ACHP and the National Conference of State Historic Preservation Officers that outlines how the BLM administers their activities subject to Section 106 of the NHPA. Each State that operates under the PA has a "protocol" agreement that defines how the BLM and that State's Historic Preservation Officer (SHPO) will operate and interact under the PA. The BLM LCDO follows the PA and the New Mexico protocol to meet their Section 106 responsibilities. For the Copper Flat project, the BLM identified historic properties in the project area and determined the potential effect of the project to those properties. BLM is consulting with the New Mexico SHPO on their determination of effect and will work with the SHPO and the ACHP to identify measures to avoid, minimize, or mitigate those effects. These measures will be described in a PA that is signed by the BLM, ACHP, SHPO, and NMCC.

1.6.2 State Permits and Approvals

A number of State permits would also be required for the project. The NMED would issue most of these permits, including air quality permits and groundwater discharge permits (DPs). Alta submitted an application for a modification to the existing groundwater DP-001 for the project in early 1995. However, DP-001 was suspended until a Stage 1 Abatement Plan for a small groundwater impact associated with the existing TSF is submitted and approved. In addition, an application for a revised Air Quality Permit (No. 365-M-1) was also submitted by Alta in early 1995. This permit was closed in 2002 due to inactivity (THEMAC 2011). In addition to approval by the State under the New Mexico Mining Act, NMCC would be required to secure a number of additional State and Federal permits and approvals. (See Table 1-1.)

1.6.2.1 Cooperating Agencies

The BLM signed Memorandums of Understanding (MOUs) with NMCC, NMEMNRD Mining and Minerals Division (MMD), the NMED, and NMDGF in 2011 and with the OSE in 2012. The MOUs identify the roles and responsibilities of each of the cooperating parties in developing the EIS and executing related State permitting processes. Each MOU formally designates MMD, the NMED, OSE, and NMDGF as cooperating agencies in the EIS. As such, these agencies share information and analyses, raise appropriate concerns, and assist with review of internal draft documents (BLM and THEMAC 2011; BLM and NMDGF 2011; BLM and NMED 2011; BLM and NMEMNR 2011; BLM and OSE 2012).

Table 1-1. Major Permits and Approvals

Table 1-1. Major Permits and Approvals	
Permit/Approval	**Granting or Regulating Agency**
	Federal
Approval of MPO	BLM
Completion of NEPA process	BLM
National Dredge and Fill Permit (Section 404)	U.S. Army Corps of Engineers
Federal Communications Commission License	Federal Communications Commission
Mine Safety and Health Administration registration	Mine Safety and Health Administration
Explosives permit	Bureau of Alcohol, Tobacco, and Firearms
Endangered Species Act	USFWS
	State
Mining permit	NMEMNRD – Mining and Minerals Division (MMD), Mining Act Reclamation Bureau
Mine registration	NMEMNRD – Mine Registration Reporting, and Safeguarding Program – Mine Registration
Permit to construct (air quality)	NMED – Air Quality Bureau
Permit to operate (air quality)	NMED – Air Quality Bureau
Permit to appropriate water	New Mexico OSE – Water Rights Division – District IV
Permits for dam construction and operations	New Mexico OSE – Dam Safety Bureau
Approval to operate a sanitary landfill	NMED – Solid Waste Bureau
Liquid waste system DP	NMED – Ground Water Quality Bureau
Groundwater DP	NMED – Ground Water Quality Bureau (DP-001)
NHPA	New Mexico Department of Cultural Affairs – Historic Preservation Division
Spill Prevention Control and Countermeasures Plan	U.S. Environmental Protection Agency
Aboveground petroleum storage tank registration	NMED – Petroleum Storage Tank Bureau

Source: THEMAC 2011.

1.6.2.1.1 New Mexico Environment Department

NMED was established in 1991 under the provisions set forth in the Department of the Environment Act by the 40th New Mexico Legislature (NMED 2012a). The NMED's mission is to provide the highest quality of life throughout the State by promoting a safe, clean, and productive environment. The agency is committed to promoting environmental awareness through open and direct communication and sound decision making by carrying out departmental mandates and initiatives in a fair and consistent manner (NMED 2011).

Within NMED, the Water Quality Program organization is composed of the Ground Water Quality, Surface Water, Department of Energy Oversight, and Hazardous Waste Bureaus. One of the Ground Water Quality Bureau's goals is to protect the quality of New Mexico's groundwater and surface water through the issuance of permits and monitoring water quality. One of the objectives under this goal is to "increase the number of permitted facilities in compliance with groundwater DP requirements." Strategies under this objective are listed below:

- Ensure requirements of groundwater DPs are met by conducting inspections of permitted facilities.
- Document groundwater inspection and compliance reviews in a database.
- Review and evaluate monitoring results submitted by permitted groundwater facilities to determine if facilities are in compliance with their permits (NMED 2011).

The NMED conducts all of the permitting, spill response, abatement, and public participation activities for mining facilities in New Mexico, in accordance with the Water Quality Act, New Mexico Statutes Annotated (NMSA) 1978, 74-6-1 to 17, the Water Quality Control Commission Regulations outlined in Title 20, Chapter 6, Part 2 of the New Mexico Administrative Code (NMAC), and the Copper Mine Rule (Section 20.6.7 NMAC) in Title 20, Chapter 6, Part 2 and Part 7. In addition, the NMED participates in the implementation of the New Mexico Mining Act and Non Coal Mining Regulations by reviewing and commenting on mine permits and closeout plans, coordinating environmental protection requirements at mine sites with MMD, and providing determinations that environmental standards will be met during operation and after closure of mining operations (NMED 2012b).

In order to begin operations and discharge of effluent or leachate, the proposed copper mine must be issued a DP by the NMED. NMCC submitted a permit application to the NMED for a DP in 2011 and is planning to resubmit its application pursuant to the Copper Mine Rule (Section 20.6.7 NMC) and to account for changes to the original mine plan.

1.6.2.1.2 New Mexico Energy, Minerals, and Natural Resources Department, New Mexico Mining and Minerals Division

The MMD is within the NMEMNRD organization, which was created in 1987 through a merger between the Natural Resources Department and the Energy and Minerals Department. However, the various administrative components (divisions) of the Department have been in existence longer. The mission of the Department is "to position New Mexico as a national leader in the energy and natural resources areas for which the department is responsible." Its vision is: "a New Mexico where individuals, agencies, and organizations work collaboratively on energy and natural resource management to ensure a sustainable environmental and economic future" (NMEMNRD no date(a)).

NMEMNRD includes the following divisions: Energy Conservation Management, Forestry, State Parks, MMD, Oil Conservation, and the Youth Conservation Corps (NMEMNRD no date(a)). The NMDGF is also administratively attached to NMEMNRD, but receives no direct budget support from it (NMEMNRD no date(b)).

One element of MMD's mission is to promote the public trust by ensuring the responsible utilization, conservation, reclamation, and safeguarding of land and resources affected by mining. The MMD pursues this mission via four major programs. The Abandoned Mine Land Program works with grants from the Federal government to identify, safeguard, and reclaim (pre-1977) abandoned mines that present a public safety hazard or environmental detriment. The Coal Mine Reclamation Program regulates, inspects, and enforces regulations on all coal mines not on Indian Reservations. The Mining Act Reclamation Program regulates, inspects, and enforces regulations on all hard rock or mineral mines. The

Mine Registration Program registers all mines, collects production and employment data on active mining operations, distributes statistical information on New Mexico's mining industry, and acts as the division's public information office (MMD no date).

The MMD administers NMAC Title 19, Chapter 10, which recognizes the requirements of the New Mexico Mining Act. The purposes of this Act (NMSA 1978 69-36-1 to 20) include promoting responsible utilization and reclamation of land affected by minerals exploration, mining, or the extraction of minerals that are vital to the welfare of the State.

NMCC has submitted a Permit Application Package (PAP) to the MMD. The PAP consists of a sampling and analysis plan, a baseline data report, and a mining operations and reclamation plan. When these plans and reports are deemed administratively and technically complete, MMD, with the assistance of the third-party EIS contractor, conducts an EE. MMD then notifies the public that a draft EE has been prepared, and a public hearing is held if requested. The public may submit comments, which must be addressed by MMD. If necessary, the EE and PAP are modified, and a new mine permit is approved or denied (NMEMNRD 2010).

1.6.2.1.3 New Mexico Office of the State Engineer

The OSE (or State Engineer) is responsible for administering the State's water resources. The State Engineer has power over the supervision, measurement, appropriation, and distribution of all surface and groundwater in New Mexico, including streams and rivers that cross State boundaries. The State Engineer is also Secretary of the Interstate Stream Commission, which is charged with separate duties, including protecting New Mexico’s right to water under eight interstate stream basins, ensuring that the State complies with each of the basin compacts, and water planning in New Mexico (OSE 2005).

All water users in New Mexico must have a permit from the OSE. When evaluating an application for a new appropriation or to change the place or purpose of use of an existing water right, the State Engineer must determine: 1) that water is available; 2) that the appropriation will not impair existing rights; 3) that the intended use meets State water conservation efforts; and 4) that the intended use is not detrimental to the public welfare (OSE 2006).

State water law also requires that the applicant publish the application in a newspaper and provide anyone with a legitimate objection the chance to protest the application (OSE 2006).

1.6.2.1.4 New Mexico Department of Game and Fish

The mission of the NMDGF is “to conserve, regulate, propagate and protect the wildlife and fish within the State using a flexible management system that ensures sustainable use for public food supply, recreation, and safety and to provide for off-highway motor vehicle recreation that recognizes cultural, historic, and resource values while ensuring public safety” (NMDGF 2012).

In its Strategic Plan for fiscal years (FY) 2013 – FY 2018, the NMDGF developed the following objectives that are relevant to its role as a cooperating agency in the decision making process for the Copper Flat mining development (NMDGF 2012):

Conservation Services Program P717:

- **Objective 10:** Attain measurable progress toward the restoration of wildlife identified as being at risk of depletion or extinction.
- **Objective 11:** That legal and illegal take of threatened or endangered species or subspecies does not impede the prospects for their recovery.

Program Support P719:

- **Objective 1:** Sustainable management decisions are being made considering biological, social, and economic factors.

1.6.3 Water Rights Approval

1.6.3.1 Current Status

NMCC has claimed the right to divert and use a total of 7,376 acre-feet per year (AFY) of groundwater from wells under State Engineer File No. LRG-4652 et al. The groundwater would be used to support proposed mining operations.

In a response to a NMCC application to repair and deepen wells, the New Mexico OSE concluded that the allowed diversion amount is limited to 888.783 AFY (OSE 2014). NMCC is appealing this determination pursuant to NMSA 1978, Section 72-2-16 (1973). The matter is pending before the New Mexico OSE's Hearing Unit in Hearing No. 12-055.

The New Mexico Environmental Law Center, on behalf of the Elephant Butte Irrigation District et al., has filed a motion with the State of New Mexico, County of Doña Ana, Third Judicial District Court requesting designation of stream system issue and expedited inter se of the water rights claimed by NMCC (CV-96-888, January 14, 2014).

The OSE determination and the described judicial proceedings have led NMCC to develop and consider a contingency plan to provide water for mining activities if their claimed right is not realized. In its current plans for providing water to the mine, NMCC is considering three options, as summarized below (LRPA 2014):

- **Adjudication Option:** NMCC is or will be a defendant in the Lower Rio Grande adjudication process. This option assumes that the adjudication court finds favorably that NMCC has sufficient water rights to support the mine.
- **Lease Option:** NMCC would lease surface water rights to account for all water use above the diversion amount related to groundwater pumping. NMCC is currently pursuing the lease option as the Lower Rio Grande adjudication process develops.
- **Purchase and Transfer Option:** The third option is the purchase and transfer of groundwater rights from a well located elsewhere in the basin and transferred to the NMCC production wells. The amount purchased would be the amount necessary to ensure all water uses are accounted for, including any impacts to the Rio Grande.

The OSE will ultimately approve the availability of adequate water rights in accordance with the ongoing process described above.

1.7 SCOPING

On January 9, 2012, the BLM LCDO published a Notice of Intent in the Federal Register (vol. 77, no. 5, pp. 1080-1081, Doc 2012-128) to prepare an EIS for this project in compliance with NEPA and the Council on Environmental Quality's regulations for implementing NEPA (40 CFR 1500–1508). Exploration and mining activities on BLM-administered land are controlled by the Secretary of the Interior's regulations contained in 43 CFR 3715 and 3809. These regulations require mining operations to apply for a permit to use public land for activities that are reasonably incidental to mining, to prevent unnecessary or undue degradation of the land, and to reclaim disturbed areas.

Pursuant to NEPA Section 102(2) (c), the EIS will provide agencies and the public with a general understanding of the proposed Copper Flat mine project by evaluating the environmental impacts of the proposed MPO. The EIS will also evaluate alternatives to the proposed MPO. The purpose of this evaluation is to determine whether to approve the plan as proposed, or to require additional mitigation measures to minimize impacts to the environment, in accordance with BLM regulations.

1.7.1 External Scoping

Two public meetings were held during the scoping period which began January 9, 2012 and ended March 9, 2012. Media advertisements notified the public that scoping meetings would be held in Hillsboro and Truth or Consequences, New Mexico on February 22 and 23, 2012, respectively. Public participants at the meetings numbered 59 in Hillsboro and 72 in Truth or Consequences. The open house portion of the meeting was used to encourage discussion and information sharing and to ensure that the public had opportunities to speak with representatives of the BLM LCDO, the State of New Mexico, and NMCC. Several display stations with exhibits, maps, and other informational materials were staffed by representatives of the BLM LCDO, MMD, the NMED, NMCC, and Solv (EIS contractor). The BLM and NMCC provided fact sheets and informational materials at the meetings. In addition to the scoping meetings, the BLM solicited comments through use of scoping letters, a website, a toll-free telephone number, and an email address.

1.7.2 Issues Identified in Scoping

The key issues identified from public scoping focused on water, biological resources, traffic, and social and economic concerns. The top four areas receiving comments related to resource issues are briefly summarized below.

Socioeconomics: Fifty-nine commenters provided 266 comments concerning socioeconomics. The comments addressed the current state of Sierra County's economy and the pressing need for jobs and increased tax revenue. Some commenters suggested using the mine as a source of tourism. Other commenters expressed concerns that the presence of the mine and mining operations might negatively impact current tourism revenue that depends on the quality of the environment and surface water recreation. Several commenters requested information on how the community might be compensated for potential problems associated with mining, such as loss of land use and water (both quality and quantity). Information was also requested on how loss of land and water use might affect the economy. Some commenters stated that the mine would be an economic opportunity and there may not be other economic opportunities as large in the future for the area.

Groundwater: Forty commenters provided 168 comments about groundwater. Commenters expressed concern that mining activities might either reduce available groundwater or pollute groundwater, which in turn would affect the community and environment. Concern was also expressed about the development of a cone of depression if mining operations pull water from the aquifer, and how this would affect wells, surface water, and wildlife. Some commenters questioned water use during droughts and water conservation practices in general to maintain groundwater.

Water Quantity: Thirty-six commenters provided 146 comments concerned with water quantity. Commenters expressed concern that the water use of the mine coupled with potential water pollution would affect the amount of safe drinking water available to the people, agriculture, plants, and wildlife of Sierra County. Several commenters asked how they can be assured that the amount of water proposed to be used would not affect the amount of water available for other uses or permanently deplete the aquifer.

Surface Water: Twenty-nine commenters provided 98 comments concerned with surface water, which mainly focused on water quantity and water quality. Commenters expressed concern that mining operations would reduce stream levels and pollute surface water areas, which can affect wildlife, plants, and livestock operations. Commenters expressed concern that the aquifer would be permanently affected by mining activities and that this drawdown would affect surface water over the long term.

These key issues were considered in an alternatives development session attended by the BLM, cooperating agencies, and the third-party EIS contractor and were then incorporated into the following impact questions used to develop the alternatives to the Proposed Action:

- How will groundwater withdrawal affect surface ecosystems and other users?
- How will mining activities impact surface water and groundwater quality for present or foreseeable future use?
- How will mining activities use water efficiently?
- How will mining activities directly or indirectly affect wildlife species, their habitat, and their behavior?
- How will the mine affect public services, health and safety, and local economies?

1.7.3 Issues Excluded from the Analysis

No issues identified in scoping were specifically excluded from further analysis. Many of the scoping issues were incorporated into the impact questions identified above that were used to develop alternatives. Those issues that were not incorporated directly were identified and reserved for possible use as impact mitigations once the effects on specific resources were analyzed.

CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

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CHAPTER 2. PROPOSED ACTION AND ALTERNATIVES

In accordance with the National Environmental Policy Act (NEPA), this Environmental Impact Statement (EIS) must describe the Proposed Action and alternatives (40 CFR 1502.14). The EIS must consider a range of reasonable alternatives, including the Proposed Action and No Action Alternative, and provide a description of alternatives eliminated from further analysis (if any exist) with the rationale for elimination (40 CFR 1502.14(a)). This section provides that discussion.

The Copper Flat project (project) is the proposed reestablishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico. The Proposed Action would consist of an open pit mine, flotation mill, TSF, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. In most respects, the facilities, disturbance, and operations would be similar to the former operation. The project is owned and operated by the New Mexico Copper Corporation (NMCC), a wholly-owned subsidiary of THEMAC Resources Group Limited (THEMAC) (THEMAC 2011).

Background: Records show copper and gold mining has occurred in and around the Copper Flat location for more than 125 years. Modern exploration efforts at Copper Flat date back to the 1950s. Quintana Mineral Corporation (Quintana Minerals) began development of the Copper Flat mine in the 1970s (NMCC 2014a). An Environmental Assessment Report (EAR) was prepared for the Quintana operation in 1977 by the Bureau of Land Management (BLM) Las Cruces District Office (LCDO) to analyze potential impacts resulting from granting rights-of-way (ROWs) for utilities and access roads, as well as impacts resulting from the mine development. The ROWs were approved by the BLM in the EAR and air quality, tailings discharge, and water discharge permits (DPs) were issued by the State of New Mexico. In 1982, Quintana Minerals brought the property into production as an open pit mine with a mill and concentrator. The Quintana facility required approximately 2 years to construct. The initial mine excavation needed to expose the ore body occurred during the 4- to 6-month period immediately preceding startup of the mineral processing plant. Following startup of mineral processing, the mine was in commercial production for 3.5 months until all operations were halted due to a significant decline in copper prices (NMCC 2014a).

In 1986, all on-site surface facilities were removed and a BLM-approved program of non-destructive reclamation was carried out. Much of the property's infrastructure, including building foundations, power lines, and water pipelines, was preserved for reuse in the event copper prices recovered sufficiently to make reactivating the mine economically viable (THEMAC 2011).

In 1991, a proposed plan of operations was filed with the BLM by Gold Express Corporation to reactivate the Copper Flat mine. The BLM initiated an Environmental Assessment (EA) because Federal land would be "newly" disturbed. New archaeological, biological, threatened and endangered species, air quality, hydrologic, and socioeconomic studies were conducted. However, it was determined in 1993 that an EIS would be required for the mine development due to concerns related to water quality issues, and the EA was never completed (THEMAC 2011).

Alta Gold Company (Alta) acquired the property in early 1994 and proposed to rebuild the Copper Flat mining facility essentially as it existed in 1982. Alta submitted an updated mine plan of operations (MPO) and associated environmental baseline data to the BLM for initiation of the EIS process. The draft Environmental Impact Statement — Copper Flat Project (draft EIS) was completed by the BLM in 1996. A preliminary final EIS — Copper Flat Project was prepared by the BLM in 1999 following public comment on the draft EIS. However, the EIS and record of decision (ROD) were never finalized because Alta declared bankruptcy in early 1999 (THEMAC 2011).

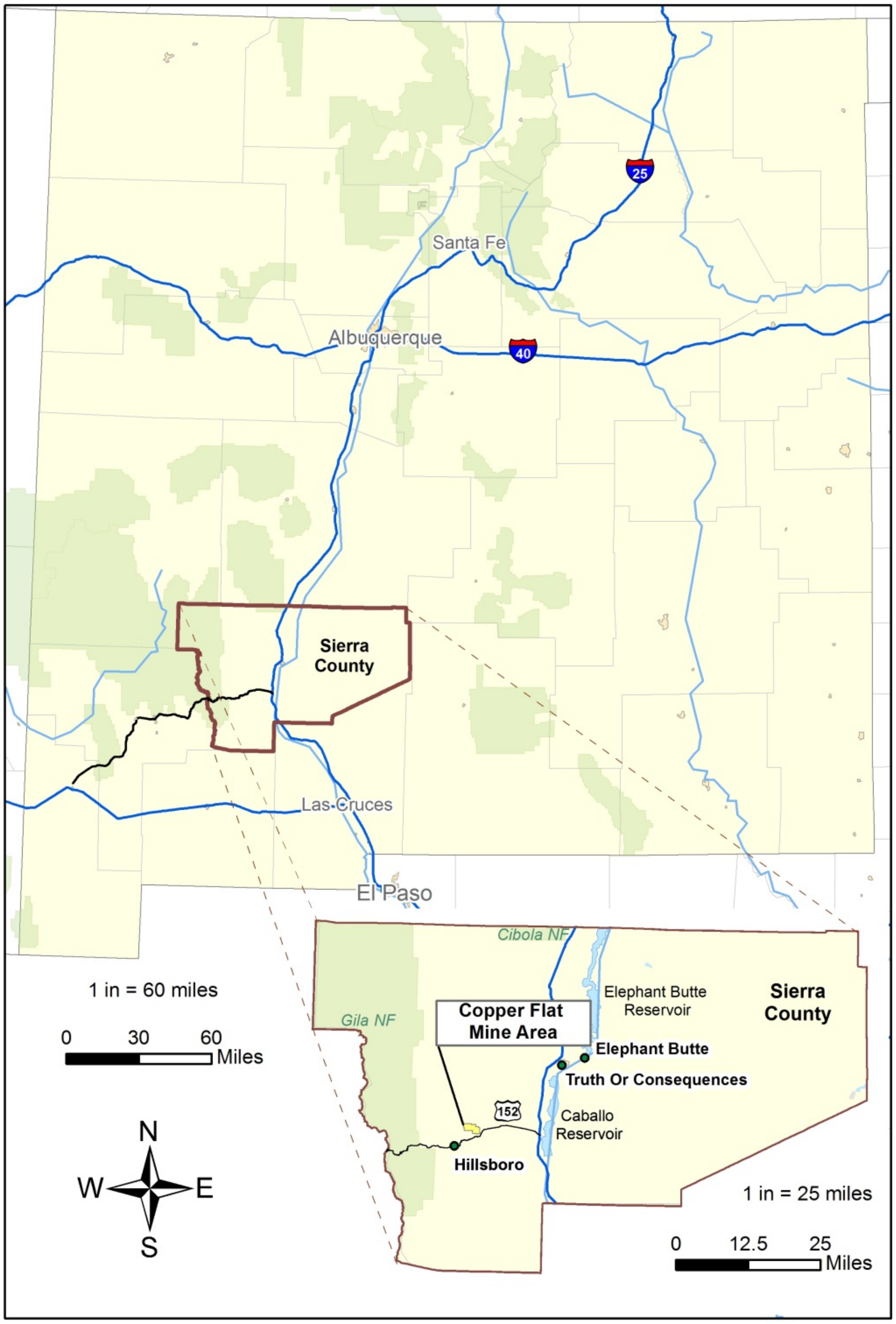
NMCC acquired the Copper Flat property in 2009 with the intent to re-establish an open pit mine and processing facility similar to the Quintana Minerals operation. Current work to evaluate and potentially re-permit the Copper Flat mine includes the development of this EIS and numerous studies that have been conducted to support the analysis presented herein. Permitting efforts with the State of New Mexico have included initiating the process toward a new mine permit with the New Mexico Mining and Minerals Division (MMD) through submission of a Sampling and Analysis Plan and subsequent baseline data reports. NMCC submitted an application for a new air permit; this was issued by the New Mexico Environment Department (NMED) Air Quality Bureau in July 2013. Efforts to renew the DP associated with the mine area are underway with the NMED Ground Water Quality Bureau. In addition, work to address previous impacts at the site associated with the Quintana facility has included the submission of a Stage I Abatement Plan that was approved by the NMED in February 2012 and four quarterly periods of groundwater and surface water monitoring in 2013 (NMCC 2014a). The general location of the mine is depicted in Figure 2-1.

Land Status: The Copper Flat project is composed of a mixture of public and private land that includes patented and unpatented mining claims (lode, placer, and millsite). The area inside the proposed mine area is 2,190 acres. Activity at the Copper Flat mine in 1982 disturbed approximately 361 acres of BLM-administered public land and 549 acres of private land (THEMAC 2011).

The reestablishment of the Copper Flat mine would affect nearly 1,586 acres within the mine area, approximately 910 acres of which have been previously disturbed and 676 acres that would be newly disturbed land, and 97.2 acres outside the mine area for ancillary facilities. Overall, the proposed Copper Flat project would disturb approximately 745 acres of unpatented mining claims on public land and 841 acres of private land controlled by NMCC. Approximately 57 percent of the area needed for the proposed MPO has been disturbed by prior operations, and approximately 90 percent of the ore would be mined from private land (THEMAC 2011).

Portions of the waste rock disposal areas, as well as the crushing facility and the mill facility, would be located on public land subject to unpatented mining claims controlled by NMCC. Approximately 28 percent of the TSF and 10 percent of the open pit would be located on public land subject to mining claims controlled by NMCC (THEMAC 2011).

Figure 2-1. Project Location Map



Source: THEMAC 2011.

2.1 PROPOSED ACTION

The Proposed Action was submitted to the BLM in June 2011 in the form of an MPO that was based upon the plan of operations that Quintana Minerals used in the previous operation of Copper Flat mining activities in 1982, with some upgrades and modifications based on current engineering designs and regulations. The Proposed Action was designed to reuse the existing foundations, production wells, water pipeline, and electrical substation that were employed by the previous Quintana operation. Additionally, the Proposed Action would reuse existing infrastructure on an existing brownfield site.

The Quintana operation worked at a 15,000 ton per day (tpd) rate; the alternative defined as the Proposed Action proposes to increase that throughput to 17,500 tpd to increase efficiency. The Proposed Action varies from some of the original Quintana mine plant elements in ways that would increase efficiency and improve the performance of mine infrastructure. NMCC's Proposed Action includes a lined tailings storage facility (TSF), which would increase water recycling and meet new regulation standards in New Mexico. The Proposed Action's TSF liner would be a substantial upgrade from the unlined TSF previously employed at the site.

The primary source of information about the Proposed Action is the Copper Flat MPO, dated December 2010 and revised June 2011. As the project has evolved, additional or revised information has been developed to more accurately describe the Proposed Action and address current regulatory requirements. These changes from the most recent version of the MPO are referenced separately throughout the EIS.

The NMCC proposed operation includes the following activities:

- Expand the mine area to include additional land controlled by NMCC;
- Provide for exploration over entire proposed plan area;
- Expand the existing open pit;
- Re-activate existing haul and secondary mine roads;
- Expand, operate, and reclaim existing waste rock disposal facilities (WRDFs);
- Construct, operate, and reclaim low-grade ore stockpiles;
- Construct, operate, and reclaim the mill and associated processing facilities;
- Construct, operate, and reclaim the TSF;
- Construct ancillary buildings (administration offices, laboratory, truck shop, reagent building, substation, gatehouse, etc.);
- Re-activate and maintain an existing water supply network;
- Construct growth media stockpiles for use in future reclamation of the site; and
- Re-activate and maintain surface water diversions.

The 2,190 acres within the mine area consist of 1,227 acres of BLM land (361 acres previously disturbed and 384 acres newly disturbed) and 963 acres of private land (549 acres previously disturbed and 292 acres newly disturbed). Thus, the project would directly impact 1,586 acres within the mine area. (See Table 2-1.)

Table 2-1. Summary of Proposed Disturbance Within the Mine Area

Table 2-1. Summary of Proposed Disturbance Within the Mine Area	
Disturbance	**Total (Acres)**
TSF	627
Open pit	169
WRDFs	260
Low-grade ore stockpile	99
Haul roads	58
Plant site area	184
Growth media stockpiles	101
Diversion structures	48
Exploration	40
Total Disturbance	**1,586**
Public land	745
Private land	841

Source: NMCC 2014a.

The project would also impact 97.2 acres for ancillary facilities outside the mine area as shown in Table 2-2.

Table 2-2. Summary of Proposed Disturbance to Ancillary Facilities

Table 2-2. Summary of Proposed Disturbance to Ancillary Facilities				
Disturbance	**Total (Acres)**	**BLM Land**	**NM State Trust Land**	**Private Land**
Pipeline corridor	44.4	34.6	7.8	2.0
Millsites	45.0	45.0		
Production well roads	7.8	7.8		
Total Disturbance	**97.2**	**87.4**	**7.8**	**2.0**

Source: NMCC 2015.

Annually, the mining operation would process an estimated 6.4 million tons of copper ore mill feed. Waste rock production is estimated to average 2.4 million tons per year (tpy) (ranging from 1.0 to 4.0 million tpy) with tailings production estimated at 6.3 million tpy, with the difference from mill feed leaving the site as mineral concentrate. An operational life of approximately 16 years plus additional time for permitting, construction, and closure is currently projected for the operation (NMCC 2014a). The duration of each of the phases of the Copper Flat project are estimated as follows:

- Pre-construction (permitting) - 2 years (estimated);
- Construction (site preparation) - 2 years;
- Operations (mineral extraction) - 16 years;
- Closure/reclamation - 3 years; and
- Post-closure monitoring - 12 years.

For the most part, the plant facilities would be constructed at the site of the original Quintana plant site, and, to the extent practicable, would use most of the original concrete foundations. The plant site, which would include the crusher, concentrator, assay lab, mine shop, warehouse, security, and administration buildings, would occupy approximately 184 acres and would be located between the open pit and the TSF.

Scheduled operating time for the mill would be 24 hours per day, 7 days per week, and 365 days per year. Products produced by the mine would be two mineral concentrates: a copper concentrate, which would contain the recovered copper, gold and silver, and a separate molybdenum concentrate. The concentrate would be sold to an off-site buyer and transported from the mine by truck to another location for smelting and refining. A general depiction of the proposed mine layout is provided in Figure 2-2.

2.1.1 Mine Operation - Open Pit

The mining of new ore would entail the expansion of an existing open pit. Currently, a portion of the ore body at Copper Flat is exposed at and near the surface and would be mined by conventional truck and shovel open pit methods in a manner similar to the previous operation. Over the life of the project, the mine would produce approximately 100 million tons of copper ore. Low-grade copper ore would likely be processed at the end of the mine life. As such, it would require stockpiling until eventually processed. The operation would process at a nominal throughput of 17,500 tpd of ore through the copper sulfide flotation mill, using standard technology similar to that of the previous operation. While the operation would focus primarily on copper and molybdenum, other poly-metallic resources such as gold and silver would be extracted from the Copper Flat ore.

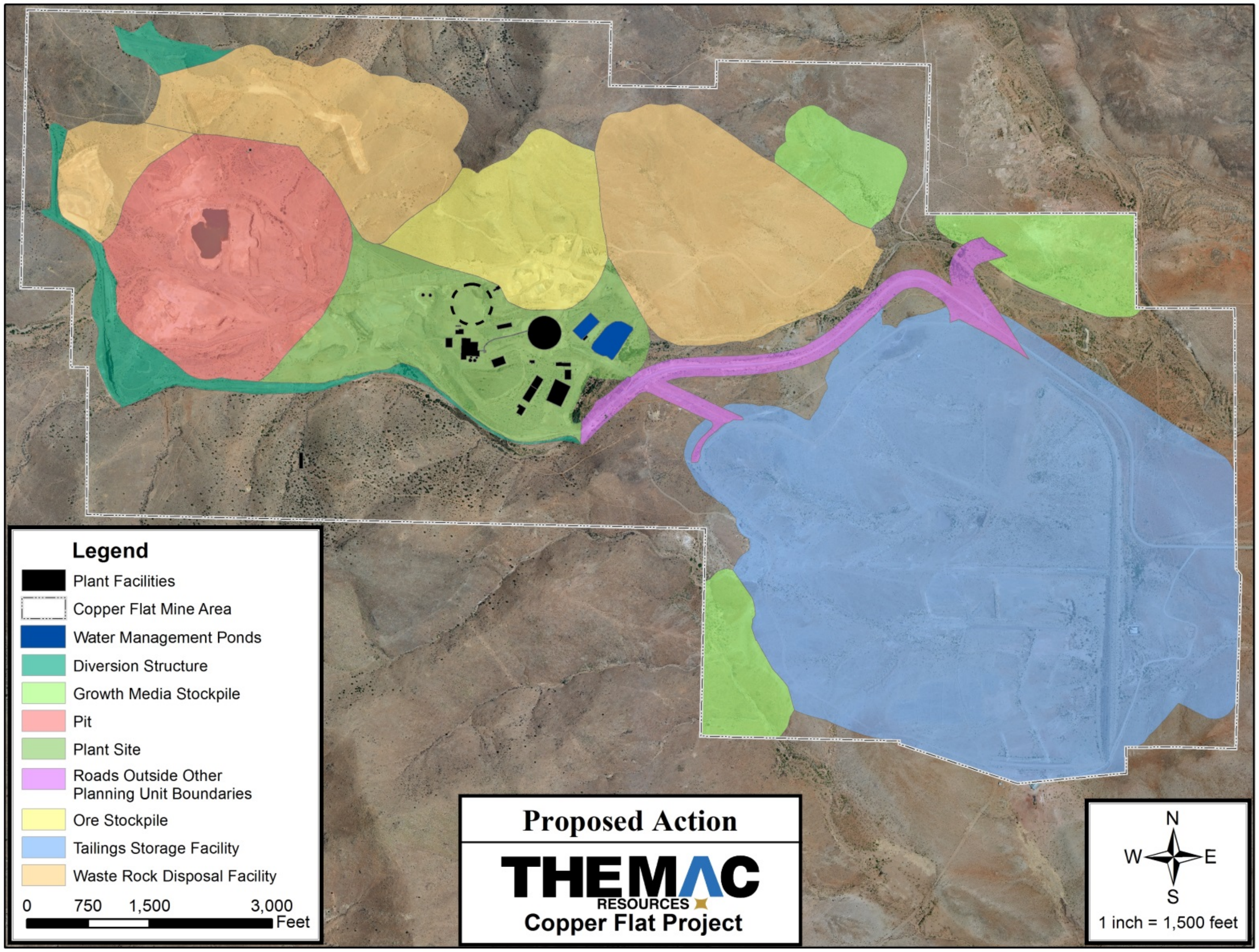
Preproduction stripping of overburden was completed in 1982 during the previous operation. Approximately 3 million tons of overburden material was stripped and over 1.2 million tons of ore was mined from the existing pit during the early 1980s.

The existing pit would eventually be enlarged to a diameter of approximately 2,800 feet with an ultimate depth of approximately 780 vertical feet below the pre-mining ground surface at the middle of the Copper Flat Basin and approximately 900 vertical feet below the high point of the pit wall. The area of the pit would be expanded from the current 102 acres to 169 acres. A diversion of Greyback Arroyo, constructed south of the pit, would not be altered by the proposed pit expansion.

Bench height would be 25 feet, and the working inter-bench slope of the pit walls would range 38 to 45 degrees (NMCC 2012a). Safety benches would remain as required by regulation. Because the deposit cannot be mined sequentially, there is no plan to backfill the pit although some benign waste rock would be used for pad preparation, plant site development, and in connection with the reclamation of disturbed areas.

Ore material from the pit would be drilled and blasted, loaded, and hauled to the primary crusher and then conveyed to the process mill where the mineral values would be removed by conventional flotation processes. Waste rock would be placed in designated disposal areas.

Figure 2-2. Mine Layout – Proposed Action



Source: NMCC 2015.

Blasting would be limited to daylight hours and performed by trained and certified blasters. Rotary diesel-driven drills or electric-powered or down-the-hole hammer drills would be used for blast hole drilling. Wet drills would be used in conformance with Mine Safety and Health Administration (MSHA) requirements for secondary breakage when necessary. Safe seismic disturbance and air blast limits would be established to prevent damage to buildings.

Blasting agents and explosives would be stored in secured areas in compliance with applicable State and Federal regulations. Ammonium nitrate and diesel fuel would be stored on-site in bins and tanks. Detonators, detonating cord, boosters, caps, and fuses would be stored apart from the batch plant area in secured separate magazines. All locations chosen for storage of blasting agents and explosives would be selected to provide for the safety of personnel and the public and to comply with regulations.

Cuttings samples would be taken from blast holes. Based upon the assay values of these samples, the broken rock in the pit would be classified as "ore" or "waste." The broken rock would be loaded onto end-dump haul trucks for transport to the primary crusher, low-grade stockpile, or waste rock disposal area(s) depending on the assay classification.

Loading of both ore and waste rock would be accomplished by front end loaders (NMCC 2012a). Ore and waste rock haulage would be handled by a fleet of end-dump, diesel-powered haulage trucks with a nominal 100-ton capacity (NMCC 2012a). Additional units may be added to the fleet over time as the pit is deepened.

Noise from the mine equipment would comply with and be regulated under MSHA. Mining equipment types would consist of standard units that are typical of the mining industry and would be fitted with mufflers, spark arresters, and other fire prevention and safety equipment. The major equipment proposed for the mine operation is shown in Table 2-3.

Table 2-3. Major Mine Equipment Fleet on Hand

Table 2-3. Major Mine Equipment Fleet on Hand																	
Equipment	**Year of Operation**																
	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Blast hole drill, 45,000 lb.	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1
Hydraulic shovel, 14 cubic yards (y^3)	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Haul truck, 100 tons	4	6	7	7	8	8	9	9	9	9	9	7	7	7	7	7	6
Track dozer, 410 HP	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2
Wheel dozer, 354 HP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Motor grader, 16’	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Water truck, 10,000 gal.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Pioneer drill	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Backhoe, 2 yd^3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total	**16**	**20**	**21**	**21**	**22**	**22**	**23**	**23**	**23**	**23**	**23**	**21**	**19**	**18**	**19**	**19**	**18**

Source: NMCC 2012a.

Notes: Units owned based on fleet buildup and replacement.

HP = horsepower.

A 5.2-acre lake is currently located in the existing pit. The pit lake contains near-neutral water that is periodically acidic with elevated concentrations of dissolved metals and other contaminants. The floor of the existing pit is currently at 5,400 feet above sea level, which is approximately 100 feet beneath the original pre-mining ground surface. The water level in the pit lake was 5,439 feet above sea level in September 2013, indicating that the depth of the pit lake was 39 feet at that time. As a result of seasonal variations in precipitation, the pit lake water level has fluctuated by 1 to 5 feet per year.

Dewatering of the pit lake would be necessary prior to mining, and would be necessary throughout the life of the mine to facilitate mining operations. Groundwater inflow to the pit during previous operations ranged from 50 to 75 gallons per minute (gpm). The water pumped from the pit would be used for dust suppression on the roads and waste rock dumps. If necessary, pit water would be temporarily stored in a reservoir in the mineral processing area prior to use.

Initial dewatering of the pit would be accomplished with two or three portable construction trash pumps (pumps designed to move water as well as hard and soft solids such as mud, rocks, twigs, and sludge) operating on a continuous basis. Pumping characteristics would require 6- to 10-inch trash pumps. Water evacuated from the pit would be pumped to a construction pond through fused high-density polyethylene (HDPE) pipe. Dewatering the existing pit would be accomplished in approximately 30 days (NMCC 2015).

During mining, water inflows to the pit from all sources would be approximately 12 million gallons per year and dewatering would occur on an intermittent basis. As the mine progresses, mine equipment would be used to prepare small, temporary water collection sumps on each mining level as a normal part of the operation. Pumping and piping equipment used for dewatering during mine operation would be similar to the initial pit dewatering effort. The discharge pipe would follow the mine haul road to the edge of the pit and terminate at a small pond or tank at the edge of the pit; water would be drawn from this pond or tank and used for dust control on roads and other surface areas. As the mine progresses and deepens, mine crews would extend the discharge pipe by fusing additional HDPE pipe segments at the bottom of the pipe run. Pumping stations would be added at intermediate points along the mine haul road as needed to lift the water to the pit edge. During mining, the dewatering pumps would operate several times per day for a total of 3 to 5 hours per day in order to keep up with expected inflows (NMCC 2015).

Water removal from the pit would continue over the operational life of the mine through a sump or series of sumps located within the pit. Water removal would end once mining is completed. At the end of mining, the pit bottom would be 4,720 feet above mean sea level. The final pit bottom would be approximately 780 vertical feet below the pre-mining ground surface at the middle of the Copper Flat Basin and approximately 900 vertical feet below the high point of the pit wall. After mining and associated dewatering activities end, a pit lake would reform as a result of inflowing groundwater, direct precipitation, and runoff from adjacent slopes. The pit lake would eventually be approximately 200 feet deep and cover 18.6 surface acres. The size of the lake would fluctuate annually depending on precipitation and evaporation rates. At an average evaporation rate of 65 inches per year, a simulated (annual) pit water balance shows inflows of about 63 acre-feet per year (AFY) from direct precipitation and runoff from adjacent slopes, and 38 AFY from groundwater inflow; with discharge of about 100 acre-feet (AF) as evaporation from the pit water surface (NMCC 2014a).

The proposed plan also includes ongoing exploration drilling to define the copper ore body (infill and step-out drilling in addition to tests for possible deep extensions of the ore body) as well as testing for near-surface coarse gold vein and alluvial gold potential in the area of the mine.

2.1.2 Ore Processing

Ore from the pit would be hauled via end-dump haulage trucks to the primary crusher area located to the east of the pit. The ore processing operation would commence with the dumping of the ore into the primary crusher for the first stage of crushing. After the first stage of crushing, the ore would be conveyed to downstream mills for further crushing and grinding for the purpose of liberating the copper and other recoverable minerals from the host rock. During the crushing and grinding operations, a portion of this ore stream would be fed through a gravity gold separation process to recover coarse gold in the form of a concentrate.

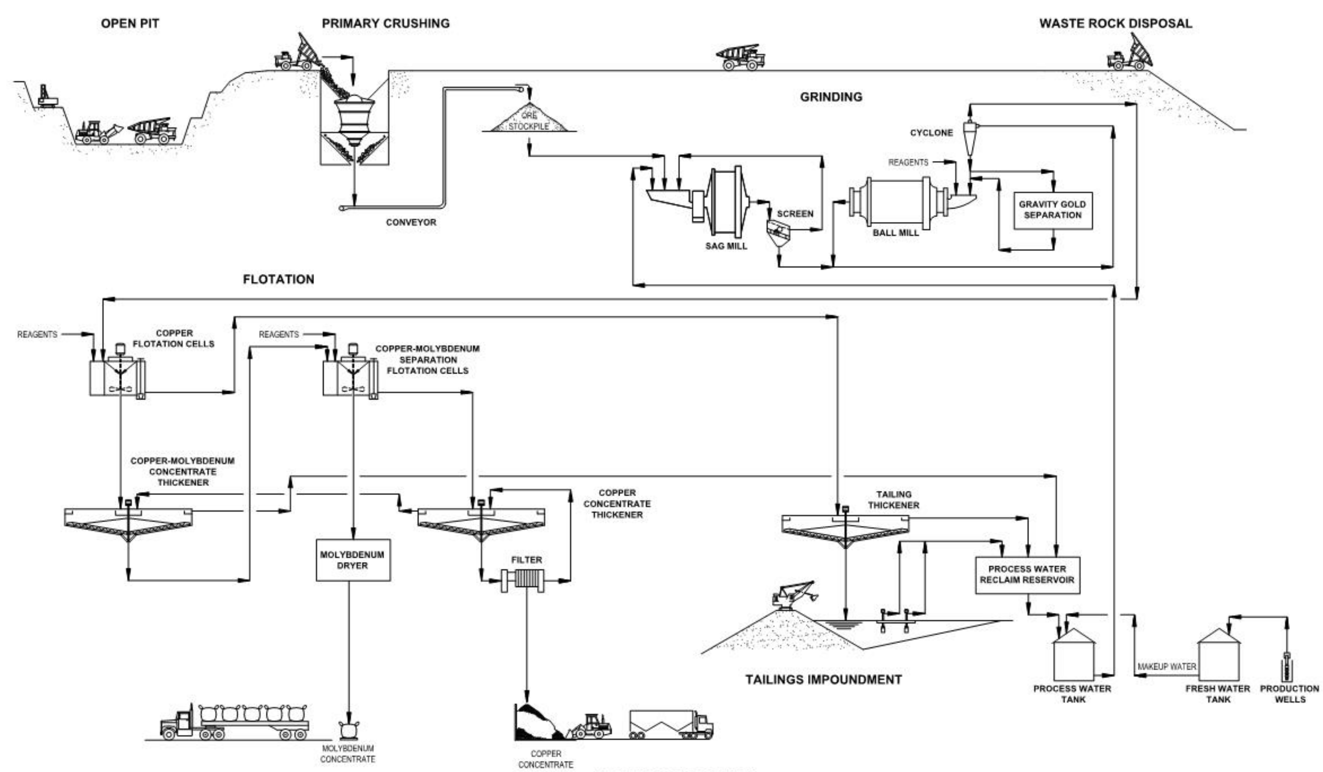
Once the ore is sized for optimum liberation of the minerals through the crushing and grinding operations, the ore would be introduced into the flotation process. In the flotation process, the ore, which at this time would include the finely ground host rock and liberated minerals, would be mixed with additional process water. Organic reagents would be added to this mixture creating a froth and causing the liberated minerals to adhere to the froth bubbles. The sulfide-mineral-laden froth would be collected and filtered to form a concentrate containing copper, molybdenum, silver, and gold minerals. This concentrate would receive further flotation processing to create a copper concentrate that contained copper, silver, and gold minerals and a separate concentrate containing molybdenum minerals.

The proposed plant would be a sulfide-flotation plant similar to that originally constructed and operated at the site by Quintana Minerals in 1982, and the plant would be typical of plants used at other locations in New Mexico, Arizona, and elsewhere. It would include a molybdenum processing circuit similar to that designed by Quintana Minerals. Additionally, the plan would include a gravity gold recovery circuit. No leaching processes (such as cyanide leaching) would be used. A general depiction of the mining process is provided in the following graphic. (See Figure 2-3.)

2.1.3 Mine Facilities

For the most part, the plant facilities would be constructed at the site of the original Quintana plant site and, where feasible and practical, the plant would use concrete foundations that were constructed for the Quintana operation in the 1980s. The plant site would be part of the larger 184-acre process/shop/administration site prepared for the Quintana operation located between the open pit and the TSF area. The sulfide flotation plant would be designed to process approximately 6.4 million tons of ore per year at a nominal throughput of 17,500 tpd (assuming 93 percent availability). Table 2-4 lists major facilities that would be constructed at the plant site as part of the Proposed Action. A general depiction of the facility layout is provided in Figure 2-4.

Figure 2-3. Mining Process – Proposed Action



Source: THEMAC 2011.

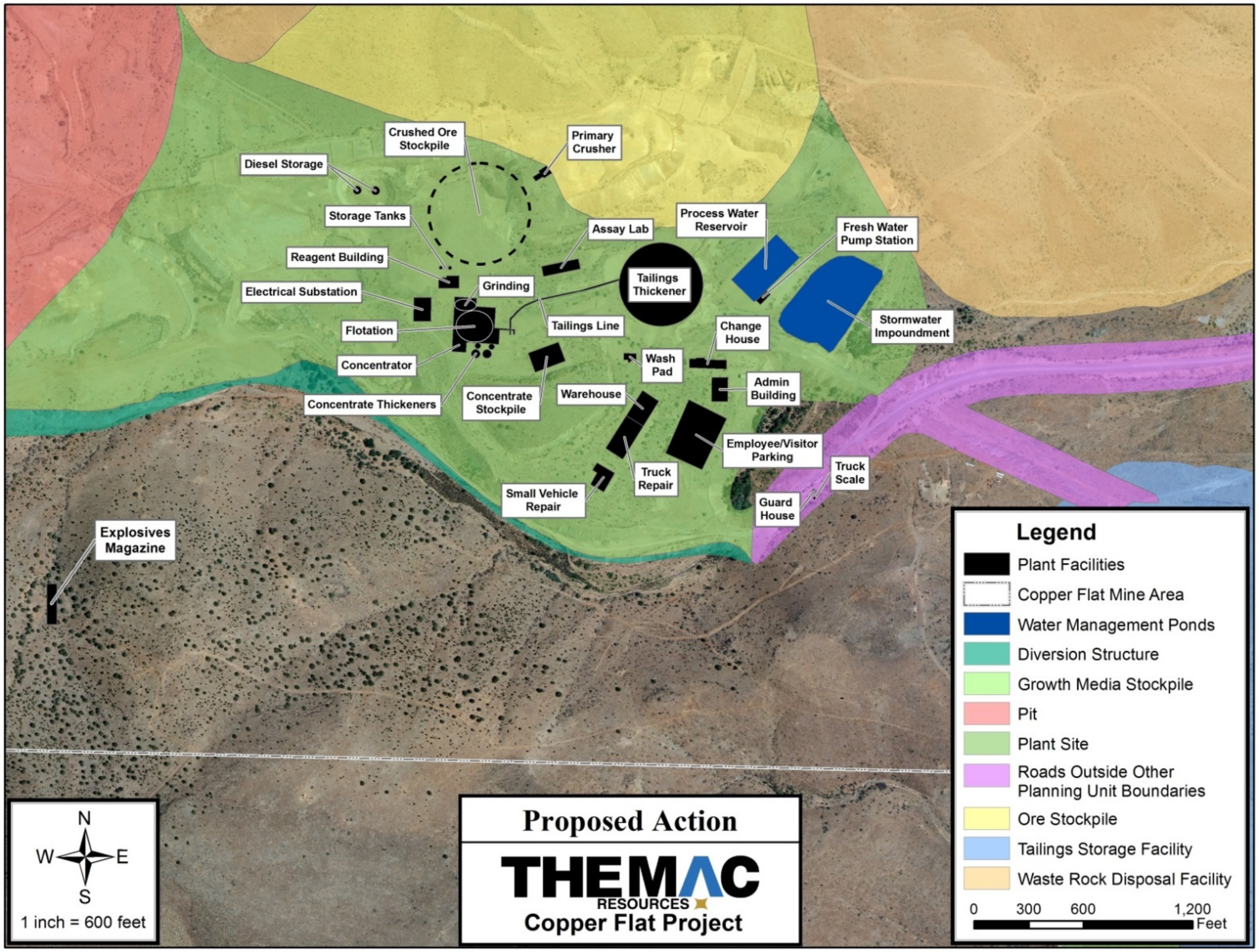
Table 2-4. Primary Plant Site Structures and Facilities

Facility	Length (ft)	Width (ft)	Height (ft)	Diameter (ft)	Slab (ft)	Construction Type
Primary crusher	90	30	103	-	0.83	Metal roof, metal siding
Primary crusher control/ mechanical building	20	15	35	-	0.67	Metal roof, metal siding
Coarse ore stockpile tunnel	400	16	26	-	Varies	Existing, below ground, reinforced concrete
Concentrator building, grinding area	192	145	125	-	1.00	Metal roof, metal siding
Concentrator building, flotation area	22	26	80	-	0.66	Metal roof, metal siding
Concentrator building, maintenance area	70	50	30	-	0.50	Metal roof, metal siding
Concentrate handling & storage area	154	103	50	-	0.66	Concrete with metal roof and siding, separate from concentrator
Filter deck	24	20	80	-	0.66	Metal roof, metal siding
Concentrate thickeners (2)	-	-	-	50	-	Steel tank
Ball bins	109	51		-	1.00	Concrete
Reagent building	60	50	26	-	0.50	Metal roof, metal siding
Reagent storage and lime handling	100	52	50	-	0.83	Metal roof, block walls
Lime mill	27	22.5	8.5	-	0.50	Metal roof, metal siding
Flammable material storage building	25	17	9	-	0.67	Metal roof, metal siding
Tailings thickener	-	-	-	350	-	Steel tank
Tailings cyclone station	Central cyclone station not used in plan; plan is individual cyclones arranged around periphery of TSF.					
Mine shop/warehouse	340	90	-	-	1.00	Metal roof, metal siding
Tire/lube	90	60	41	-	1.00	Metal roof, metal siding
Small vehicle repair building	90	30	40	-	0.83	Metal roof, metal siding
Wash pad	58	33	0	-	0.83	Concrete
Administration building	120	60	14	-	0.50	Metal roof, metal siding
Change house	180	40	20.5	-	0.50	Metal roof, metal siding
Gatehouse	8	12	10	-	0.50	Metal roof, metal siding
Assay & metallurgical laboratory	180	40	16	-	0.50	Metal roof, metal siding
Records & receiving office	41	20	12	-	0.50	Metal roof, metal siding
Copper Flat electric substation	94	68	NA	-	1.00	Outside area enclosed by 8-foot chain link fence

Table 2-4. Primary Plant Site Structures and Facilities (Continued)						
Facility	Length (ft)	Width (ft)	Height (ft)	Diameter (ft)	Slab (ft)	Construction Type
Fresh water/fire tank (1)	-	-	24	34	-	Metal
Process water tank (1)	-	-	26	20	-	Metal
Fresh water pump station tanks (6)	-	-	18	17	-	Metal
Potable water tank	-	-	7.25	12	-	Carbon steel, 6,000 gal
Seal water tank	-	-	8	8	-	Carbon steel, 3,000 gal
Reclaim reservoir fresh water surge tank	16	-		8	-	Carbon steel, 5,500 gal
Reclaim reservoir fresh water storage tank	-	-	36	40	-	Carbon steel, 300,000 gal
Off road diesel fuel storage tank (2)	-	-	24	42	-	Nominal 250,000 gal tank, field erected steel tanks
On road diesel storage tank	-	-	12	12	-	Carbon steel, 10,000 gal
Gasoline storage tank	-	-	12	12	-	Carbon steel, 10,000 gal
Engine oil storage tank	-	-	-	-	-	Carbon steel, 1,000 gal
Hydraulic fluid storage tank	-	-	-	-	-	Carbon steel, 1,000 gal
ATF fluid storage tank	-	-	-	-	-	Carbon steel, 1,000 gal
Gear oil storage tank	-	-	-	-	-	Carbon steel, 1,000 gal
Anti-freeze storage tank	-	-	-	-	-	Carbon steel, 1,000 gal
Used oil storage tank	-	-	-	-	-	Carbon steel, 2,000 gal
Recycle water tank - truck wash	-	-	12	12	-	Carbon steel, 10,000 gal
Used antifreeze storage tank	-	-	-	-	-	Carbon steel, 2,000 gal
Lime silo	18	24	25	20	0.83	200-ton capacity
Lime slurry tank	-	-	25	12	-	Carbon steel, 20,000 gal
Pax mix tank	-	-	10.67	8	-	Carbon steel, 4,000 gal
Pax distribution tank	-	-	10.67	8	-	Carbon steel, 4,000 gal
Methyl isobutyl carbinol (MIBC) storage tank	-	-	6	8	-	Carbon steel, 2,000 gal
No. 2 diesel storage tank	-	-	10	11	-	Carbon steel, 7,000 gal
Sodium hydrosulfide (NaHS) mix tank	-	-	10.67	8	-	Carbon steel, 4,000 gal
NaHS distribution tank	-	-	10.67	8	-	Carbon steel, 4,000 gal
Molybdenum collector mix tank	-	-	6	8	-	Carbon steel, 2,000 gal
Molybdenum collector distribution tank	-	-	6	8	-	Carbon steel, 2,000 gal
AERO 238 mix tank	-	-	10.67	8	-	Carbon steel, 4,000 gal
AERO 238 distribution tank	-	-	10.67	8	-	Carbon steel, 4,000 gal

Table 2-4. Primary Plant Site Structures and Facilities (Concluded)						
Facility	**Length (ft)**	**Width (ft)**	**Height (ft)**	**Diameter (ft)**	**Slab (ft)**	**Construction Type**
NaHS stock tank	-	-	10.67	8	-	Carbon steel, 4,000 gal
Flocculant tanks (2)	-	-	7.25	12	-	Carbon steel, 6,000 gal each tank
Gravity concentrator tank	-	-	9.5	12	-	Carbon steel, 8,000 gal
Copper concentrate stock tank	-	-	24.6	17	-	Carbon steel, 42,000 gal
Explosive magazines (2)	8	8	8	-	-	Manufactured/constructed, located and secured per Federal and State regulations
Ammonium nitrate silo	-	-	60	15	-	Manufactured/constructed, located and secured per Federal and State regulations

Figure 2-4. Mine Facilities – Proposed Action



Source: THEMAC 2011.

Equipment in the concentrator building is expected to consist of the following (NMCC 2014a):

Primary Crushing

- One 42- x 65-inch gyratory crusher; and
- One 48-inch x 454-foot-long stockpile feed conveyor.

Grinding

- One 32-foot-diameter x 14-foot-long semiautogenous (SAG) mill, 10,000 horsepower;
- One 18-foot-diameter x 28-foot-long ball mill, 6,000 horsepower;
- One 4.5-foot cone crusher, 300 horsepower (grinding circuit pebble crusher);
- One UTM-600 tower mill (copper regrind);
- One KW-100 tower mill (moly regrind);
- Two 8- x 20-foot double deck vibrating screens;
- One primary cyclone cluster with ten 26-inch diameter cyclones;
- One cyclone feed pump, 800 horsepower;
- One 48-inch x 470-foot-long reclaim conveyor;
- One 36-inch x 89-foot-long SAG mill oversize conveyor;
- One 36-inch x 257-foot-long pebble crusher feed conveyor; and
- One 36-inch x 101-foot-long pebble crusher product conveyor.

Flotation

- Ten 1,500-cubic-foot (ft^3) bulk rougher cells (copper/moly);
- Thirteen 300-ft^3 cleaner cells (copper);
- Seven 24-ft^3 cleaner (copper);
- Eight 100-ft^3 rougher cells (moly);
- Five 18-ft^3 cleaners (moly); and
- Five 15-ft^3 cleaners (moly).

Concentrate

- One 50-foot-diameter bulk concentrate thickener (copper/moly);
- One 50-foot-diameter concentrate thickener (copper);
- One 12- x 14-foot press belt drum filter (copper); and
- One 4.5- x 5-foot press belt drum filter (moly).

Tailings

- 350-foot-diameter tailings thickener.

2.1.3.1 Primary Crushing Facilities

As the ore exits the pit, it goes to the primary crusher. The primary crusher would be located within the existing foundation about 2,500 feet east of the pit. Normally, ore hauled from the pit would be dumped directly into the primary crusher; however, some ore may go to a small stockpile near the crusher and be fed to the crusher at a later time. The primary crusher would reduce the mine run rock to a nominal size less than 8 inches in diameter. Crusher discharge would be fed by apron feeder onto a belt conveyor for transport to the coarse ore stockpile located near the mill. Storage capacity of the coarse ore stockpile would be about 75,000 tons. The crusher would be located below ground level to limit noise and contain dust. The crusher would normally operate 12 to 16 hours per day; however, the crusher would occasionally operate longer as needed to maintain production (NMCC 2014a).

2.1.3.2 Grinding

Crushed ore would be removed from the coarse ore stockpile by three draw chutes and apron feeders located in an existing ore reclaim tunnel located under the stockpile. The ore would be fed onto a belt conveyor for transport into a large diameter SAG mill for grinding. Reduction in the SAG mill would be the result of impact between the rock entering the mill and 5-inch steel grinding balls fed to the mill along with the rock. Water and various reagents would be added to the SAG mill feed to start the conditioning of the ore pulp for subsequent stages of treatment.

The SAG mill would discharge onto a double-deck vibrating screen for sizing. Rock passing through both screen decks (undersize) would travel to the cyclone feed sump. Rock remaining on top of the upper screen deck (oversize) would be taken by belt conveyor to a cone crusher where it would be crushed to less than 0.75-inch in diameter and returned by belt conveyor to the SAG mill. Rock passing through the upper screen deck but not passing through the bottom screen deck (middling) would be returned directly to the SAG mill by conveyors. Ore from the cyclone feed sump would be pumped to a cluster of hydro-cyclones for material sizing. The fine product from the hydro-cyclones would be sent to the feed sump for the first stage of flotation, and the coarse product from the hydro-cyclones would go to the ball mill for further grinding (NMCC 2014a).

2.1.3.3 Flotation and Concentration

Cyclone overflow from the feed sump would report to the first stage (rougher) flotation cells connected in series. Each cell would be equipped with a mechanism that would agitate or stir and induce air into the ore pulp as it passed through the tank. Reagents would be added to the pulp to cause the mineral bearing sulfide mineral particles to adhere to bubbles created by the induced air and frothing agents. Reagents such as xanthate, sodium hydroxide, MIBC, sodium hydrosulfide, and diesel fuel would be used in the concentrator for the mineral flotation process. Small amounts of other reagents may be used in the process from time to time as part of an ongoing effort to improve metal recoveries and to cope with changing ore characteristics. The mineral bearing sulfide laden bubbles would rise to the top of the cell to be skimmed off. The copper/molybdenum concentrate floated off of the primary rougher would be routed to the molybdenum plant where the copper would be depressed and the molybdenum would be floated up, graded, filtered, and dried. After separating the molybdenum, the copper concentrate, which would average about 28 percent copper, would be dewatered in a settling facility (thickener) to decant water, then disk filtered to 12 percent moisture and stored for shipment.

The copper concentrate would be loaded by a front-end loader into covered trucks for transportation off-site to a smelter. The molybdenum concentrate would be dried and packaged in sacks for shipment. Filtrate from both the copper flotation circuit and the molybdenum flotation circuit would be returned to concentrate thickeners. Thickener overflow would be returned to the plant reclaim water system (described in more detail below in Section 2.1.16, Environmental Protection Measures). No smelting or refining would be conducted at the mine area.

The plant site surface drainage was originally designed to contain or control a 24-hour precipitation event of 2.6 inches with a maximum 1-hour intensity of 2.0 inches. These calculations would be verified during the engineering design phase of the project in accordance with current regulatory requirements and design criteria. Surface runoff from the area around the administration/mine office, concentrator, assay building, reagent storage, and tailings thickener would be controlled by surface grading and directed to a containment pond. Water from the containment pond would be used for mineral processing make-up water or dust control at the site (NMCC 2014a).

All mechanical, civil, structural, and architectural designs would be in accordance with applicable standards and codes. Equipment and fabricated items would be furnished with manufacturers' standard finish and retouched after erection. Safety painting would be in accordance with MSHA standards and New Mexico mining codes.

2.1.3.4 Tailings Storage Facility

An existing TSF at Copper Flat was constructed by Quintana Minerals to serve their 1982 mining operation. Tailings are the materials left over after the process of separating the valuable ore. The TSF received 1.2 million tons of material and was reclaimed in 1986. The TSF remains in place and is located southeast of the former plant site. NMCC proposes to construct a new, lined TSF over the area used by previous operations for tailings disposal. Tailings would be transported from the mill via slurry pipeline and deposited in the TSF. Ancillary facilities associated with the TSF would include a tailings slurry delivery system, a tailings solution reclaim and recycling system (barge pump system), and an underdrain collection and return system. The TSF would be lined to limit infiltration of process water into the subsurface and to increase efficiency of water recycling.

Approximately 95 million tons of tailings processed through the mill are expected to be impounded over the life of the project. During operation, water would be pumped from the TSF and returned to the process circuit.

TSF Design: The new TSF would be expanded approximately 1,000 feet to the east of the existing unlined TSF. NMCC proposes to utilize the existing 1982 Quintana dam as a borrow source for the new starter embankment construction and supplement with mine waste and alluvial material. The proposed method of construction for the new TSF is by centerline raises, using cycloned tailings sand that is compacted to form a stable embankment. The centerline construction method was selected because the tailings deposition rate of rise is expected to be greater than 10 feet per year in the first 5 years and up to 80 feet per year in the initial 2 years of TSF operation (NMCC 2014a). Initial construction would include a toe berm to buttress the tailings embankment and a starter dam for placement of the tailings header line and cyclones. Sand (cyclone underflow) would be placed on the embankment while the tailings slimes (cyclone overflow) would be discharged to the TSF interior. A geomembrane liner would be placed beneath the starter dam and anchored on the crest of the toe berm. An underdrain system consisting of filter compatible soil and drainage collection pipes would be placed on top of the geomembrane liner and beneath the sand dam footprint to facilitate drainage and consolidation of the cycloned sand. The liner and underdrain system would extend into the total area of the TSF interior.

Underdrainage would be routed to a lined underdrain collection pond located downstream of the toe berm. The TSF would be constructed in a phased manner. During initial construction phases, diversion ditches would be constructed to divert stormwater from upstream catchment areas within the area contributory to the TSF. The contributory area is approximately equivalent to the ultimate TSF footprint, as only minor peripheral areas drain into the TSF. At final build out, minimal potential exists for surface water run-on from external areas. Throughout most of the life of the facility, stormwater management requirements would be limited to direct precipitation.

Based on the rules and regulations of the New Mexico Office of the State Engineer (OSE), the Copper Flat TSF would be classified as a large dam having significant hazard potential. All considerations regarding dam design addressed in this section of the document would require approval under a permit granted by the OSE Dam Safety Bureau. As such, the TSF would be designed to contain the equivalent of 100 percent of the probable maximum precipitation (PMP) during operations. A spillway capable of passing 75 percent of the PMP would be required upon closure.

TSF Process: Following the flotation process, the remaining slurry consisting primarily of non-valuable minerals, pyrite, miscellaneous un-floated minerals, and water would flow into a tailings thickener for partial dewatering. The slurry would enter the tailings thickener at approximately 30 percent solids by weight. Water would be removed by decanting and the tailings would exit the thickener at 50 percent solids. Water removed by the thickener would be returned to the process water pond for reuse (NMCC 2014a).

The thickened tailings would then flow by gravity through a 24-inch pipeline into the TSF. To contain possible spills or leaks, the TSF pipeline would be constructed between earthen berms. The pipeline foundation materials and berms would be sloped to direct any spillage or leakage to the TSF. Thickened tailings slurry would be distributed around the periphery of the TSF by numerous spigots or hydro-cyclones, which separate coarse material from the fines in the slurry. The coarse material deposited at the periphery of the TSF would be used to construct embankment rises from the new starter embankment. The fine silt and slimes would flow away from the upstream face of the raised embankment toward the pool.

As the finer material flows into the TSF, gravitational settlement of solids would form beaches. Supernatant solution (the residual water in the tailings that seeps to and collects on the surface of the TSF as the tailings settle and compress) and precipitation runoff would flow towards the TSF low point formed by the beaches to form the free pool. Tailings deposition would be managed to force the pool away from the embankment towards an ultimate pool location. The tailings used to form the initial beaches would have a permeability coefficient of approximately 1×10^{-6} cm/sec after consolidation occurs, due to progressive loading.

Water returning to the TSF would be recovered from the pool of water that would form in the TSF and be returned to the mill process water system for reuse. Stormwater runoff could also contribute to the volume of water in this pool. The height of the embankment would be designed to contain the normal operating volume of water completely within the TSF, combined with the amount of stormwater runoff from 100 percent of the PMP, which is estimated to be about 26 inches for a single event.

The size and location of the TSF pool would vary during the life of the project. The size of the pool would be affected by pre-deposition grading in the TSF, the amount of tailings deposited, precipitation, evaporation rates, water collection rates by the underdrain collection and return system, and water recycling rates. The location of the pool would migrate as tailings beaches form but would remain within the TSF area. Tailings deposition would be managed to force the pool away from the embankment toward the upstream reaches of the TSF. The TSF area would be fenced to restrict access.

TSF Monitoring: The TSF would be regulated by the OSE Dam Safety Bureau for safety of operations. The design, operation, and closure inspection of the TSF dam would be subject to approval of the OSE. The OSE requires the submittal of monthly reports of the tonnages deposited into the TSF along with readings of the piezometers, settlement devices, and settlement monuments that monitor movement.

The NMED Ground Water Quality Bureau requires a monthly report of tonnages of tailings discharged along with analyses of the tailings to identify possible contaminants. Samples of water from new monitor wells proposed downstream of the tailings dam would be analyzed quarterly and the results sent to the Ground Water Quality Bureau. These samples would be used to identify any leakage from the new, lined TSF. Abatement plans would be implemented should leakage and contamination be detected.

2.1.3.5 Ancillary Facilities

The process plant complex would include buildings such as a mine administration building, an assay lab, a mobile equipment shop, a truck scale, and the security gatehouse (NMCC 2014a).

The administration building would be approximately 60 feet by 120 feet with a 14-foot eave height. The building would have central heating and air conditioning and would accommodate the plant administration, engineering, accounting, secretarial, and clerical personnel. Appropriate sanitary facilities would be provided for men and women.

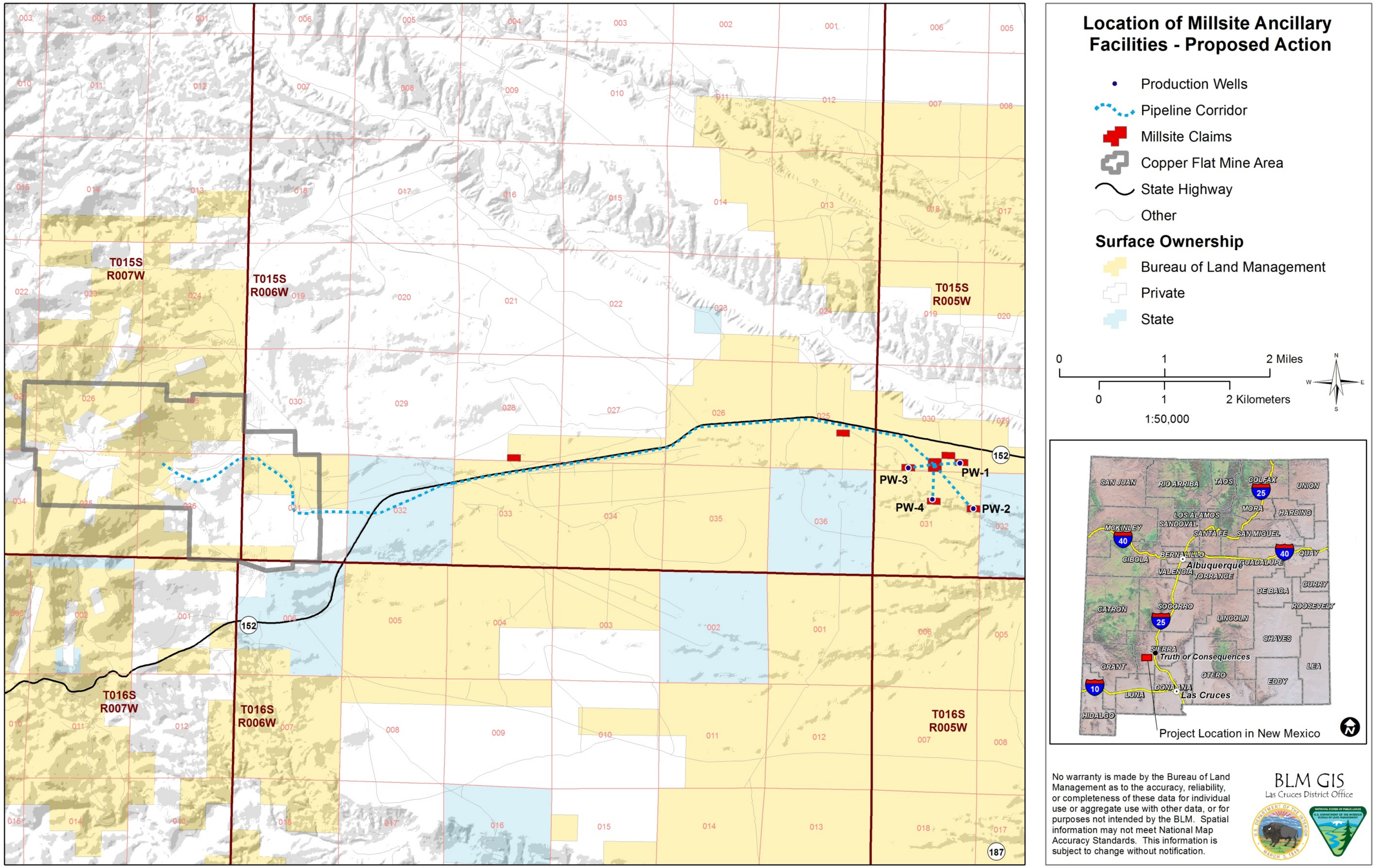
The assay and laboratory offices would be 40 feet by 180 feet. Appropriate sanitary facilities would be provided. A small air compressor would be mounted on an exterior concrete pad for furnishing service air to the building. The security gatehouse building would be approximately 8 feet by 12 feet. A parking area for employee vehicles would be located adjacent to the main plant entry gate. The shop and warehouse building would be an equipment servicing facility. The reagent building would be a 60-foot by 50-foot building. The buildings would all be prefabricated, standard, rigid-framed structures. All mechanical, civil, structural, and architectural designs would be in accordance with applicable standards and codes. Equipment and fabricated items would be furnished with manufacturers' standard finish and retouched after erection. Safety painting would be in accordance with MSHA standards and New Mexico mining codes. Buildings and facilities would be painted in colors consistent with guidance provided in the BLM Handbook 8400, Visual Resource Management.

Outside the mine area for the mine there are nine millsite claims that were previously established by Quintana. (See Figure 2-5.) The individual 5-acre parcels (45 acres total) would be used for staging, equipment, well pads, water tanks, pumping systems, truck access, and structures to maintain the water supply pumping stations.

An existing 20-inch water supply line, as described in Section 2.1.7, Water Supply, would provide fresh water needed for the mining operations. Four production wells would provide the water to the pump station. The BLM granted a ROW (ROW NMNM 125293) to allow NMCC to test the pipeline strictly for the purpose of the feasibility studies. The same ROW originally allowed access to a water facility and access roads. With amendments, the ROW added access to the pipeline, and for testing only, access to the four production wells and another six monitoring wells. This ROW could be renewed and retired if the project is approved. The pipeline would be located within a 60-foot-wide corridor, occupying the following the BLM-owned, privately-owned, and State-owned areas outside the mine area:

- Total BLM land area: 34.6 acres;
- Total private land area: 2.0 acres; and
- Total State Trust land area: 7.8 acres.

Figure 2-5. Location of Millsite Ancillary Facilities – Proposed Action



Source: BLM 2015.

2.1.3.6 Sanitary Wastewater Treatment

Sanitary liquid wastes would be handled and disposed of through two existing septic tanks/leach fields permitted by the NMED. The septic systems would be slightly modified, including enlargement of the leach fields and placement of larger septic tanks. At closure the septic tanks and leach fields would be decommissioned.

The washing facility for the mobile equipment would be equipped with a water/oil separator system. Grey water from the equipment wash facility would be reused for washing equipment or recycled for use in the ore processing stream. Sediment from the equipment wash facility would be taken to the TSF for disposal.

2.1.4 Waste Rock Disposal Facility

WRDFs would be located adjacent to the open pit in areas used for waste rock disposal by the previous operator. These disposal areas would be expanded to cover approximately 260 acres. Prior to the expansion of existing disposal areas into previously undisturbed areas, reclamation materials (including suitable growth media and "topsoil") would be removed and stockpiled for future use in reclamation.

The primary WRDF for the Proposed Action is located east-northeast of the process area on the east side of Animas Peak. Two smaller WRDFs would be located adjacent to the pit. The waste rock disposal areas would be regraded and reclaimed to blend into the surrounding topography to the extent practicable. Horizontal surfaces would be regraded and contoured to reduce infiltration of water and provide positive drainage to sediment collection points.

Water erosion controls, such as berms and diversion ditches, would be installed to divert runoff away from the WRDFs. These diversion ditches and berms would also be used to control water inflow onto waste rock disposal piles containing partially oxidized and unoxidized material. Runoff from the WRDFs and the low-grade ore stockpile would be controlled by diverting the runoff water into collection ditches and then recycling it into the process water system. No discharge is expected to occur from the WRDFs' stormwater collection system. The final grading plan for the WRDFs would be designed to eliminate surface water run-on, improve runoff, reduce infiltration, reduce visual impacts, and facilitate revegetation through back-grading or crowned grading. Catch benches would be left in place to interrupt surface sheet flow, and regrading would approximate the adjacent and nearby geomorphic land shapes. At the end of the mine life, the height of the largest disposal area would be 340 feet higher than at present, 5,900 feet above sea level. The WRDFs are designed to facilitate regrading during reclamation.

During operations, the WRDFs would be constructed in up to 200-foot lifts to facilitate regrading during reclamation so the overall slope faces would not exceed 3.0H: 1.0V. Benches would be established at the existing lift elevations and at intermediate intervals to reduce erosion. Surface runoff from Animas Peak would be diverted around the disposal area to prevent surface run-on and infiltration into the waste rock. As the WRDFs progress, concurrent reclamation would be performed on areas that are no longer needed for future mine operations or for access (NMCC 2014a). Concurrent reclamation is reclamation activity that is performed while mine operations are ongoing.

For reclamation, the WRDFs and any remaining stockpiles would be regraded and surface runoff velocity dissipaters would be constructed to reduce velocities and limit erosion and soil loss. Exact design parameters, which are specific to the site climatology and soil conditions, would be reviewed and approve as part of the mine operations and reclamation plan.

To limit oxidation potential post closure, the reclaimed waste rock and any remaining stockpiles would be covered with a consolidated layer of reclamation cover to limit infiltration of water and oxygen and then covered with growth media and vegetated.

2.1.4.1 Reclamation Material

The quantity of reclamation material would be determined by the specifics of the mine and reclamation plans. Suitable reclamation materials would be identified in the field by qualified personnel. A sufficient quantity of reclamation materials has been identified as available for salvage. (See Table 2-5.)

Table 2-5. Available Reclamation Material (yd^3)

Table 2-5. Available Reclamation Material (yd^3)	
Location	**Quantity**
Open pit	316,000
Plant site	205,000
TSF	14,800,000
Waste rock & low-grade stockpile facilities	1,016,000
Total	**16,337,000**

After field identification and marking, reclamation materials would be recovered and the stockpiles constructed using standard earthmoving equipment such as scrapers, excavators, loaders, trucks, and track dozers.

Three separate reclamation stockpiles are planned and a general location for each has been identified on the site plans. Specifics regarding the location and footprint of each stockpile would be finalized to address conflicts with requirements identified by other studies (cultural resources, facility access and location plans, etc.). Studies of existing soils and growth media at Copper Flat show that material characteristics are fairly consistent to depths and across areas considered for salvage. Segregating materials by soil type or horizon is not planned. The combined storage volume of the three reclamation stockpiles is sufficient to meet future needs for cover and growth media. (See Table 2-6.)

Table 2-6. Reclamation Stockpile Storage Capacity (yd^3)

Table 2-6. Reclamation Stockpile Storage Capacity (yd^3)	
Stockpile ID	**Stockpile Capacity**
GM-01	510,000
GM-02	2,100, 000
GM-03	1,900,000
Total	**4,510,000**

If additional storage capacity becomes necessary, other areas suitable for storing reclamation materials are available within proposed facility footprints and inside the mine area.

During construction, the stockpiles would be built, shaped, and maintained in a manner that limits material loss due to wind erosion and equipment impacts. After shaping, the surface of the stockpiles would be seeded with an agency-approved seed mix to provide a plant cover to protect material loss from wind erosion and provide a source of organic material.

During construction, vehicle access onto the stockpiles would be limited to only vehicles and equipment needed for placement, shaping, and seeding. After the stockpiles are established, vehicle and equipment access onto the stockpiles would be prohibited except for stockpile maintenance or emergency purposes. Signs to identify the nature of the stockpile and provide notice of no access will be located around the perimeter of each stockpile. The stockpiles would be inspected for indications of vehicle access, water or wind damage, or damaged/fallen signs and prompt action would be taken to address any issues identified.

2.1.5 Project Workforce and Schedule

The construction phase of the project is expected to take approximately 2 years. During this time, the workforce for development of the Copper Flat mine would average about 120 to 130 persons per day. The estimated operational life required to recover the proven minerals (copper, molybdenum, gold, and silver) is 16 years. Approximately 80 to 100 people would be employed in the office and mine; 40 to 70 people would be employed in the mill. The reclamation workforce would consist of up to 20 employees.

Southwestern New Mexico and Sierra County have a history of mining and agriculture, and NMCC would provide employment opportunities to individuals living in the immediate area of the mine. It is likely that personnel from outside the local area would be required to meet the full staffing needs of the mine; however, the southwestern United States provides a large base of experienced personnel to complete the employee roster (NMCC 2014a). The mine would operate 24 hours per day, 7 days per week, and 365 days per year. The mill would operate on that same schedule. Administrative personnel would work a standard day shift, 5 days per week, 50 weeks per year. Labor requirements for the mine are displayed in Table 2-7.

Table 2-7. Mine Personnel Requirements - Year One

Table 2-7. Mine Personnel Requirements - Year One	
Work Type	**Number of Employees**
Mine salary	10
Mine operators	52
Mobile maintenance	26
Mine tech services	4
Process salary	8
Process operators	30
Process maintenance, electricians, etc.	17
Process tech services	6
Administration	17
Total Mine Workforce	**170**

Source: NMCC 2014a.

All work types would be constant over the life of mine with the exception of mobile equipment operators and mobile maintenance. These two groups would grow over the first third of the mine life as the pit gets larger (primarily adding haultruck operators and associated mechanics). The total workforce would peak at about 180 employees in or around year 5 of operation. From years 5 through the end of mine life the workforce needs would fall to levels lower than year 1 due to the decrease in the required stripping ratio, which would decrease mobile equipment operator and mobile maintenance needs. Around 150 to 160 personnel would be employed by the end of mine life (NMCC 2014a).

2.1.6 Electrical Power

Power for the project would be furnished by Sierra Electric Cooperative by means of an existing 115-kilovolt (kV) transmission line that runs from the Caballo switching station near the junction of Interstate 25 (I-25) and NM-152. The transmission line terminates within 300 feet of the mill facility at the site of the proposed mine substation.

The 115-kV line was a dedicated line to Copper Flat installed for the 1982 mine to avoid interfering with power supply to the community of Hillsboro and the surrounding rural areas. The existing 115-kV line is a wooden pole, H-frame structure and would be in full accordance with State and Federal electric codes. Tri-State Generation and Transmission owns the line and is responsible for maintenance (ROW Grant #NMNM 32038). The mine substation would be reconstructed in the same location as in 1982 and would be fenced and constructed in accordance with BLM stipulations. NMCC would own the substation equipment and would be responsible for construction and maintenance. From the substation, the voltage would be stepped down by primary transformers and distributed throughout the mine.

An existing 25-kV distribution line provides power to the production wells located east of the mine, pump stations on the fresh water pipeline, and the reclaim water pump stations at the tailings dam. Sierra Electric Cooperative owns this line and is responsible for maintenance. The plant electrical load requirement is tabulated in Table 2-8.

Table 2-8. Summary of Project Electrical Demand

Table 2-8. Summary of Project Electrical Demand	
Activity	**Demand (kWh/ton)**
Primary crushing	0.25
Total grinding	17.48
Total copper flotation	1.74
Molybdenum flotation	0.27
Thickening	0.05
Reagent handling	0.05
Water system	2.05
Ancillary facilities	0.65
Total	**22.54**

An emergency generator would be provided as backup power in the event of power loss to maintain critical systems and to aid in a controlled shut down. NMCC is analyzing the viability of solar power generation to partially offset the mine's energy demand along with other energy and water conservation measures. Because the configuration and size of the 25-kV distribution line, standard raptor-proof protective designs would be incorporated into the line design and line upgrade. This design would be used for the entire length of the distribution line within the mine area.

2.1.7 Water Supply

Water is essential to mining. It is used for ore processing, dust control, and other important activities. Water is a limited resource in New Mexico and the Copper Flat mine would implement best management practices (BMPs) to conserve this valuable resource. These BMPs would include monitoring water use, providing for water conservation, and water recycling.

The water supply for the Copper Flat mine would be composed of two distinct types of water classifications:

1. Process water: Process water is water that would be collected on-site as part of ongoing operations and that would be reused within the operation. This includes water recycled from the TSF, recycled water from stormwater catchment ponds, water contained within the copper ore rock as moisture, and recycled water from pit dewatering operations. Seventy-two percent of the water supply for the Copper Flat mine would be process water.
2. Fresh water: Fresh water is water that would be pumped to the site from off-site groundwater wells. Fresh water would be necessary to supplement process water in order to meet total water use requirements. NMCC would employ water conservation measures during the design and through the entire life of the mine. These measures would come from a combination of water recycling or reuse activities as well as activities that would decrease the need or use of water in order to minimize the amount of fresh water pumped to the site. Twenty-eight percent of the water supply for the Copper Flat mine would be fresh water.

2.1.7.1 Water Use

Total water use for the Copper Flat mine, including all recycled water, would be approximately 13,370 AF on a yearly average basis. Total water use is presented in Table 2-9.

Table 2-9. Total Water Use*

Table 2-9. Total Water Use*	
Average annual water use (AF)	13,370
Average water used to process 1 ton of material (gallons)	633
Total water use – life of mine (AF)	209,000

Note: * Includes recycled water.

Ninety-three percent of total water use would be used for processing copper ore, the direct beneficiation of minerals recovered by the operation through the improvement of physical or chemical properties of the minerals to prepare for smelting and refining. The other 7 percent of water use would be for dust control, maintenance, laboratory, and domestic use. Average annual water use by process is presented in Table 2-10 and the discussion of each water use follows.

Table 2-10. Water Use by Process*

Water Use	Acre-Feet per Year: Recycled	Acre-Feet per Year: Non-recycled	Acre-Feet per Year: Total	Percent of Total
Ore Processing:				
Reclaimable TSF water	9,096	0	9,096	68%
Water retained in tailings	0	2,650	2,650	20%
Evaporation	0	643	643	5%
Concentrates	0	13	13	<1%
Subtotal	**9,096**	**3,306**	**12,402**	**93%**
Dust control	0	726	726	5%
Other	0	242	242	2%
Total Use	**9,096**	**4,274**	**13,370**	**100%**

Note: * Includes recycled water use.

Reclaimable TSF water: A portion of the water contained in the tailings that reports to the TSF would be capable of being reclaimed. This portion of water, referred to as reclaimable TSF water, would be reclaimed at the TSF through a designed water collection system for reuse. Other portions of the water contained in the tailings would not be reclaimable due to being entrained within the tailings or lost due to evaporation. As shown in Table 2-10, reclaimable TSF water would be the single largest use of water at the operation.

Water retained in tailings: A percentage of the water reporting to the TSF as tailings thickener underflow would be retained within the tailings. Entrainment of this water within the tailings would prevent it from being reclaimed by the TSF collection systems in a timely manner and recycled.

- **Evaporation:** Some water used within the ore processing circuit would be lost due to evaporation. The majority of evaporation would occur at the supernatant pond located within the TSF, but additional evaporation losses would occur throughout the process.
- **Concentrates:** Copper concentrate produced at the site would be dewatered through a filtering process prior to shipment. However, some moisture would be retained and shipped off-site with the concentrates.
- **Dust control:** Water would be used within the mine for dust control on roads and other traffic areas.
- **Other:** The “other” category is the summation of small amounts of water that would be used throughout the site (mine operations and maintenance activities, laboratory use, domestic use, and contingency).

2.1.7.2 Water Sources

Table 2-11 and Figure 2-6 summarize the sources of water that would be used at the Copper Flat mine.

Table 2-11. Water Sources*

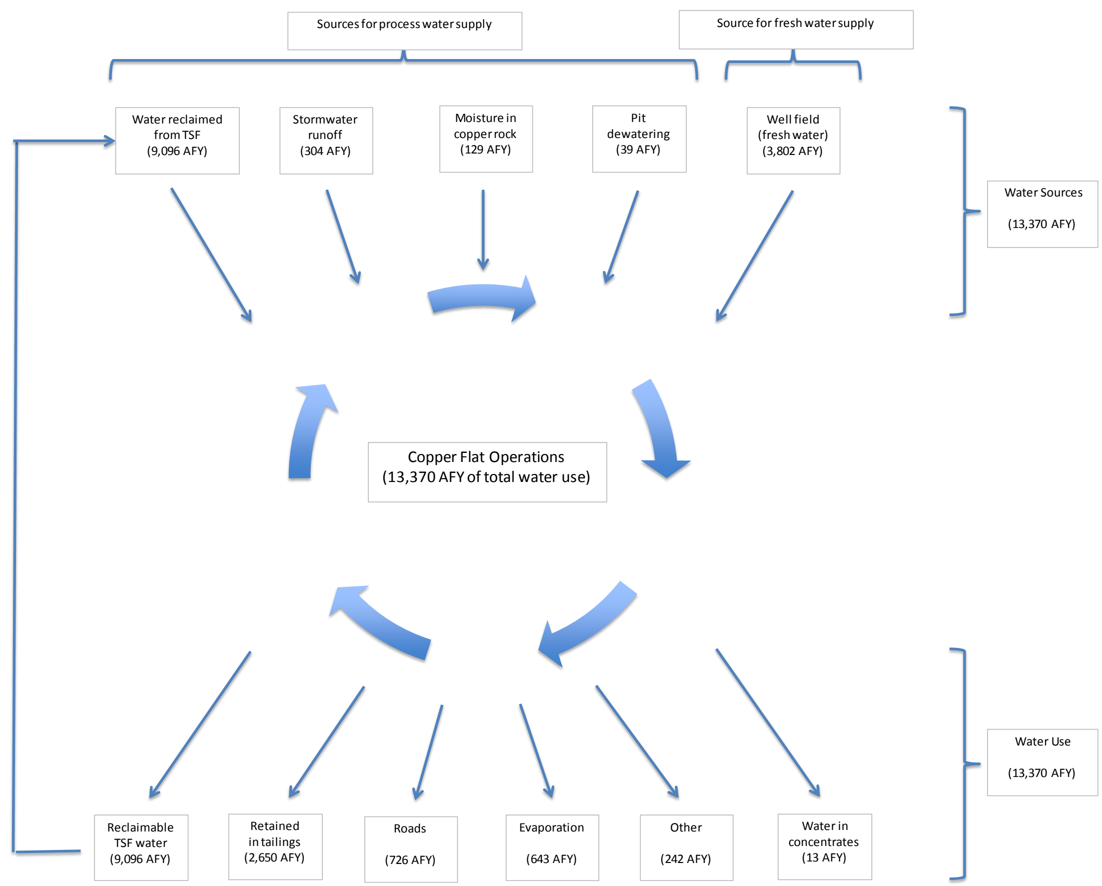
Table 2-11. Water Sources*				
	Acre-Feet per Year			Percent of Total
Water Source	Recycled	Non-recycled	Total	
Process Water:				
Water reclaimed from TSF	9,096	0	9,096	68%
Stormwater	304	0	304	2%
Moisture in the ore	129	0	129	1%
Pit dewatering	39	0	39	>1%
Subtotal	**9,568**	**0**	**9,568**	**72%**
Fresh water (groundwater wells)	0	3,802	3,802	28%
Total Use	**9,568**	**3,802**	**13,370**	**100%**

Note: * Includes water from recycled water sources.

Process Water Sources: The majority of the 13,370 AF per year of water that would be used at Copper Flat would be process water sourced on-site. These process water sources would provide for 9,568 AF per year (72 percent) of the total water use by the Copper Flat operation. Process water sources would include:

- Water reclaimed from the TSF and recycled;
- Water collected from stormwater catchment ponds and reused within the operation;

Figure 2-6. Copper Flat Water Sources and Water Use



Source: THEMAC 2015.

- Water collected by the pit dewatering operation and reused; and
- Water contained within the ore rock as moisture and mined in conjunction with the mining of copper ore.

Stormwater that would come in contact with disturbed mine and plant site areas would be collected in catchment ponds and recycled into the process water system. The use and ongoing maintenance of diversion ditches, dams, and berms would limit the amount of stormwater that would come in contact with disturbed areas and collected in catchment ponds.

The use of pit water would be for dust control only, would require a groundwater DP from the NMED, and would be subject to the applicable New Mexico groundwater standards in 20.6.2.3103 NMAC. Pit dewatering activities would be managed according to a mine operation and water management plan approved by the NMED. The mine operation and water management plan is a component of the NMED Groundwater Discharge Permit Application (NMCC 2014a).

Fresh Water Source: Four groundwater production wells would be sourced for fresh water. They are located approximately 8 miles east of the proposed mine site and south of NM-152 on BLM land. These wells (PW-1, PW-2, PW-3, and PW-4) were drilled by Quintana. Production wells 1, 2, and 3 were drilled in 1975-1976 and PW-4 was drilled in 1980. All four wells have 16-inch-diameter steel casing and vary in depth from 957 to 1,005 feet below ground surface. The wells were tested after completion to establish individual well capacities, and were the main source of water for the Quintana operation in 1982. All four production wells have remained intact and locked shut since the end of the Quintana operation and there have been no subsequent events that would compromise the quality of the water in these wells. In 2012, NMCC conducted well maintenance on PW-1 and PW-3, installed pumps in those wells to test their capacity, and conducted a localized aquifer test. The water quality in the production wells meets groundwater standards in the State of New Mexico.

Water pumped from the production wells would be conveyed through a 10-inch steel pipe to a pump station located on millsite claims between PW-1 and PW-3. From this pump station, water would be conveyed in the existing 20-inch underground pipeline to a second pump station located within the mine and plant site area. The existing 20-inch welded steel pipeline is associated with ROW Grant #NMNM 125293 and the pipeline is buried a minimum of 2 feet deep from the well field to the point of entry to the permit area. From the second pump station, water would be conveyed via pipeline for use.

Fresh water would provide for 3,802 AF per year (28 percent) of the total water use for the Copper Flat operation.

2.1.7.4 Water Conservation

NMCC would employ water conservation measures at the Copper Flat operation during the design and through the entire life of the mine. Efforts to conserve water would come from a combination of water recycling or reuse activities as well as activities that would decrease the need for or use of water. Conservation measures involving water recycling or water reuse are discussed further in Section 2.1.7.5. Water conservation measures that would be taken to decrease the need or use of water are discussed in Section 2.1.7.6.

2.1.7.5 Water Recycling

Water available for recycling would consist of water collected on-site as part of ongoing operations and reused within the operation. Approximately 70 percent of the water supply for the Copper Flat operation would be recycled water. The largest source of water for recycling is process water reclaimed from the TSF.

Some sources of recycled water would yield a consistent volume regardless of the mine plan considered (as is the case for stormwater harvesting); others would vary based on the ore processing rate. Sources of recycled water at Copper Flat would include:

- Recycling process water from the TSF;
- Stormwater harvesting;
- Pit dewatering;
- Return grey water to process stream; and
- Concentrate dewatering.

2.1.7.6 Decreasing Water Demand

When a process limits water loss or decreases the amount of water required to complete the process, the overall water required for the mine to operate decreases. Methods that would be employed on an adaptive management basis to reduce water loss or decrease water demand at Copper Flat include:

- Managing the TSF to limit the size of the supernatant pond;
- Limiting driving surfaces;
- Limiting surface disturbance;
- Interim reclamation;
- Minimizing open launders and ditches;
- Improved control of water truck sprays;
- Covering solutions storage tanks;
- Water efficient fixtures; and
- Spill and leak prevention.

Additional discussion and information regarding the primary water conservation actions that would be implemented at the mine is provided below.

- **Recycling process water from the TSF:** Recycling water from the TSF is the largest single water conservation activity that would be employed at Copper Flat. The majority of the water used at Copper Flat occurs in ore processing, and the majority of that water employed for this work would be recycled. Process water would be recovered from the TSF and returned to the ore processing circuits to offset fresh water needs. Processing ore at Copper Flat requires approximately 633 gallons of water per ton of ore processed, an amount that is typical of copper flotation circuits. Of this amount, approximately 415 gallons is supplied through recycling water from the TSF.

- **Manage TSF supernatant pond:** The size of the supernatant pond at the TSF would be managed and controlled to reduce evaporative water losses.
- **Stormwater recycling:** The mine area and TSF would be graded to limit stormwater run-on from reaching impacted areas. Impacted areas would be graded to capture the stormwater that came in contact with impacted areas, and this water would be contained in catchment ponds and recycled for use. Site plans have been prepared and evaluated using regional precipitation and runoff calculations; stormwater recycling would provide approximately 304 AFY of process water.
- **Pit dewatering:** The existing pit lake contains approximately 20 to 28 million gallons (61 to 86 AF) of water (NMCC 2014a). During operation, NMCC estimates that groundwater would continue to seep into the pit at an annual average rate of 24 gpm (39 AFY). Pumping of the pit lake would be necessary prior to mining and continuously throughout the life of the mine. Minor drilling work in 1976 indicated that groundwater in the pit area is localized in the larger fractures. As a result of seasonal precipitation, the pit water level has fluctuated by 1 to 5 feet per year. The water inflow into the pit would be used for dust suppression on the roads and dumps. If necessary, pit water could be temporarily stored in a tank or reservoir in the area of the pit. Water removal from the pit would continue over the operational life of the mine through a sump or series of sumps located within the pit. Water removal would end once mining of the pit is completed.
- **Concentrate dewatering:** After production, the final concentrate product would be dewatered by filtering prior to shipment and the reclaim water would be returned to the process circuit for reuse. In the Copper Flat design, the concentrate filters would recover approximately 83 percent of the water content of concentrates entering the concentrate filter plant and recycle it.
- **Gray water reuse:** Gray water from the equipment wash facility would be reused for washing equipment or recycled for use in the ore processing stream.
- **Surface treatment of roads:** Permanent haul roads and secondary access roads would be conditioned with an approved soil stabilizer product to bind fines and reduce water requirements for dust control. Field experience shows that water requirements for dust control can be significantly reduced through proper application and management.
- **Minimizing disturbed areas:** Construction of new haul roads, secondary access roads, and other graded areas would be limited, and where feasible, existing roads and graded areas would be closed off to traffic to reduce water required for dust control.
- **Interim reclamation:** Growth media stockpiles and disturbed areas no longer required for the operation would be graded and revegetated to reduce water requirements for dust control.
- **Minimizing open launders and ditches:** Open launders and ditches would be limited to reduce water loss to evaporation.
- **Covering solution tanks:** Fresh water tanks and, where possible, process solution tanks would be covered to reduce water loss to evaporation.
- **Water efficient fixtures:** The operation would specify water efficient fixtures in facilities to reduce water demand.
- **Water management system:** Water meters, flow control devices, and tracking logs would be employed on fresh and process water circuits. Logs would be monitored and analyzed on a regular basis to identify potential water losses and prompt action taken to address issues

when identified. In the event of water losses (i.e., a leak in the system), the response would be to find and repair the leak and clean up spills as necessary.

- **Water truck auto spray control:** Mine water trucks would incorporate digital spray control to limit overspray and overwatering conditions. Though digital spray control systems are a new application for the industry, empirical data indicates a potential 25 percent improvement over non-controlled systems.

2.1.8 Growth Media

Available growth media would be salvaged and stored in stockpiles for reclamation. Growth media would consist of soils stripped prior to surface disturbance activities and containing some organic matter. Growth media remaining in a stockpile for one or more planting seasons would be shaped for erosion control and seeded with an interim seed mix to stabilize the material, reduce establishment of undesirable weeds and noxious weeds, and assist with control of blowing dust.

2.1.9 Borrow Areas

Borrow sources would be required for prepared sub-grade materials, drainage materials, pipe bedding materials, road surfacing materials, retarding layer materials, reclamation materials, growth materials, and riprap. Construction-related borrow areas would be located within facility footprints.

Borrow area locations would depend on construction requirements and material conditions as well as locations of cultural resources sites that must be avoided. NMCC would source borrow materials from the TSF area. Other areas within the areas disturbed by construction and mining activities would be used as needed, including areas including the pit area and the waste rock and low-grade ore stockpile areas. Borrow areas would be kept free of steep walls and would be sloped and stabilized to allow for safe wildlife entry and exit and prevent erosion (NMCC 2015).

With regard to reclamation cover, no areas unaffected by construction and mining activities are currently proposed to be disturbed in order to obtain these cover materials. Several borrow areas within the limits of the TSF would be the main source of the reclamation cover. Mine haul trucks and front end loaders would be used to excavate the required materials during the construction period and stockpile it in designated locations. These locations were chosen to reduce haul distances and to limit erosion. The stockpiles would be constructed with 3H.0:1V slopes.

2.1.10 Inter-Facility Disturbance

As with most mining facilities, general ground disturbance occurs around and between structures and facilities as a result of construction, operation, and maintenance. This inter-facility disturbance is in addition to the formal footprint created by design. NMCC has included disturbance buffer zones surrounding specific facilities (i.e., TSF, waste rock disposal areas, open pit area, etc.) for the purpose of calculating the surface area for disturbance in order to ensure that the full extent of disturbance associated with these facilities is accounted for and that appropriate reclamation and bonding of these areas can be facilitated.

2.1.11 Fencing and Exclusionary Devices

NMCC would construct BLM-approved barbed wire fencing to prevent livestock from entering the pit, WRDFs, and TSF. Fences of appropriate height would be constructed around water and solution ponds to keep out larger wildlife such as deer and antelope. In areas where a higher level of security or safety is needed, such as the mine substation, chain-link fences would be erected. Gates or cattle guards would be installed along roadways within the proposed mine area as appropriate.

NMCC would monitor the fences on a regular basis and repairs would be made by NMCC as needed. In the event that livestock manage to enter the proposed mine area via a gate or opening in a fence, the grazing permittee would be contacted immediately. NMCC would assist as requested in moving these animals out of the proposed mine area.

The use of avian exclusion devices would be employed as needed to prevent deleterious exposure of birds to toxic chemicals or conditions used or created by mining and mineral processing operations.

2.1.12 Haul Roads and On-Site Service Roads

Haul roads would be constructed and utilized to haul material to the crusher, stockpiles, and waste rock disposal areas and to access the truckshop area and equipment parking areas. Some minor realignment of these roads may be necessary and road widths would vary. The on-site roads would be constructed and utilized for easy access and traffic movement within the mine area.

During operation of the Copper Flat project, water trucks would be used as needed to control emissions of fugitive dust from the haul roads as well as other roads within the mine area. Wetting agents and binding agents, such as magnesium chloride, would also be used to control dust as a water conservation measure.

2.1.13 Transportation

Access from the site is by 3 miles of all-weather gravel road and 10 miles of paved highway (NM-152) east to I-25, near Caballo Reservoir. The 10 miles on NM-152 to I-25 is mainly a straight and relatively flat road that does not include any sharp turns or significantly adverse grades. I-25 is a primary north-south highway. Traffic associated with reestablishment of the Copper Flat project would be broadly grouped as follows:

- **Concentrate shipments:** After production, shipment of concentrate and other products would be trucked off-site. Copper concentrate would be hauled by 25-ton capacity highway trucks towing 10-ton trailers to I-25 and then to a nearby railhead in southern New Mexico, and then transported by rail to a smelter in North America or to port facilities for shipping to Asia or Europe. Molybdenum concentrate and any other mineral would be filtered, dried, and packaged on-site and then transported to an off-site refinery by truck.

    a. Copper concentrate shipment schedule (hauling weekdays only) would be:

        - Years 1–5: ship 10 to 14 truckloads per day, 4 days per week;
        - Years 6 +: ship 6 to 10 truckloads per day, 4 days per week.

    b. Molybdenum concentrate shipment schedule (hauling weekdays only) would be:

        - Life of mine: ship two truckloads per month (NMCC 2014a).

- **Incoming supplies:** Vendors, equipment, and service suppliers are anticipated to take an average of 10 to 15 trips per day by truck, in total, to the mine. Except for emergencies, deliveries to the mine would be scheduled to occur during the day shift on Monday to Friday. Title 49 CFR regulates the transportation of hazardous materials in commerce. Anyone who transports, packages, loads, unloads, or in any way assumes responsibility for marking, labeling, or handling of any regulated hazardous materials must comply with 49 CFR. In addition, carriers must comply with the Federal Motor Carrier Safety Regulations of the Department of Transportation (DOT) (parts 383, 390, 397, and 399). Hazardous materials required for operation of the Copper Flat project include gasoline, diesel fuel, propane, other petroleum products, explosives, solvents for degreasing of machinery and equipment, and laboratory chemicals. These materials would be purchased from various vendors and brought to the site by truck. NMCC would ensure that the Hillsboro volunteer fire department and the Sierra County fire district are aware of the nature of the materials routinely being transported to the site, and that they have appropriate response training in the event of a spill or other accident involving hazardous materials.

- **Employees and visitors:** The majority of employees are expected to commute from the local area. It is anticipated that the majority of employees would carpool in groups ranging from two to five individuals per vehicle trip. Applying an average of 3 employees per carpool, and accounting for the planned rotation schedules, the operation would expect 40 to 45 vehicle trips for employees on day shifts Monday to Friday and 25 to 30 vehicle trips on weekend days/nights and night shift 7 days per week (total 65 to 75 employee vehicle trips per day.) An additional 15 to 20 trips per day would be expected by visitors and sales representatives. NMCC would encourage employee car and van pools. At present, there are no plans for a company-operated employee transportation system. There are no plans for rail or air access to mine facilities or operations.

2.1.14 Exploration Activities

NMCC conducted exploration activities in 2010, 2011, and 2012 to identify new reserves and expand existing reserves within the plan area. All NMCC exploration activities were completed under appropriate approvals from Federal and State agencies. Exploration and mineral evaluations were focused within and on previously disturbed Federally-administered land and privately-owned patented lands. Exploration disturbance generally included the construction of access roads, drill pads, sumps, trenches, surface sampling, bulk sampling, and staging areas. Exploration methods included both reverse circulation and core drilling, with minor trenching also conducted.

Additional future exploration activities are planned; however, exact locations of the exploration disturbance have not been determined. Future exploration activities would be composed of approximately 15,000 linear feet of drill road (average width of 20 feet), approximately 100 drill pads (average dimensions of 100 feet by 100 feet), and approximately 150 drill holes (average diameter of 5 inches; average depth of 1,200 feet below ground surface). The BLM would require future exploration activities to be handled on a case-by-case basis.

In addition to exploration activities and once mining activities commence at Copper Flat, ongoing development drilling would be required to support the operation. Development drilling would be necessary to supply data and access in the support of mine planning, reserve estimation, ore control, and pit-slope monitoring functions. Development drilling could also become necessary for pit-slope dewatering if it becomes necessary to dewater the pit slopes for stability purposes as the pit deepens. Development drilling would be conducted within the pit as well as areas adjacent to the pit perimeter. Disturbance created by development drilling activities would be within the life-of-mine pit disturbance area.

2.1.15 Reclamation and Closure

The Copper Flat mine area would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment, and land uses of the area. The objective of the reclamation plan is, at a minimum, to return the mine area to conditions similar to those present before reestablishment of the mine. The project is designed to meet, without perpetual care, all applicable Federal and State environmental requirements following closure.

2.1.15.1 Statutory and Regulatory Requirements

Reclamation of disturbed areas caused by the project would comply with Federal and State regulations. Under the Federal Land Policy and Management Act, the BLM is responsible for preventing undue or unnecessary degradation of Federally-administered public land, which may result from operations authorized by the mining laws (43 CFR 3809). The New Mexico Mining Act requires the preparation of a reclamation plan for submittal and approval by the New Mexico Energy, Mineral, and Natural Resources Division (NMEMNRD), MMD, and NMED. In addition, closure of the tailings embankment must also comply with requirements of the OSE. Reclamation activities would be carried out concurrent with mine operations wherever possible, and final closure and reclamation measures would be implemented at the time of mine closure.

2.1.15.2 Post-Mining Land Use

Major land uses occurring in the vicinity of the mine area are mining, grazing, wildlife habitat, watershed, and recreation. Following closure, the mine area would continue to support mineral development, grazing, wildlife habitat, watershed, and recreation. Following closure, the pit would partially fill with water from subsurface groundwater flow and surface water runoff resulting in a permanent TSF. The only post-closure use of the pit is a water reservoir for wildlife habitat.

2.1.15.3 Summary of Disturbance

Reconstruction would involve utilization of existing foundations and previously disturbed land where feasible. For the Proposed Action, approximately 57 percent of the proposed disturbance would take place on areas disturbed during the previous operations. New disturbance of previously undisturbed land would be kept to a minimum. Approximately 43 percent of the new disturbance would be related to the tailings and waste rock facilities.

Areas to be disturbed are divided into the following major mine components: TSF, open pit area, WRDFs, stockpiles, process facilities, stormwater diversions, structures, roads, and exploration. The utility corridor, access road, and surface water diversions were developed during the previous operations, and no further disturbance associated with these facilities is anticipated. The majority of the haul roads were also developed during previous operations and only minor additional disturbance would be related to haul road construction.

2.1.15.4 Reclamation Objectives

The objective of Copper Flat reclamation is to restore disturbed areas to a self-sustaining ecosystem consistent with applicable regulations, post-mining land use, and mine reclamation standards. Specific objectives of the Copper Flat reclamation plan are to:

- Meet or exceed applicable State and Federal reclamation requirements through application of most appropriate technologies and BMPs.
- Prevent erosion and limit contribution of suspended solids to streams and other bodies of water through employment of BMPs and contemporaneous reclamation. Contemporaneous reclamation would be conducted on disturbed areas not to be re-disturbed by future mining operations.
- Protect human health and safety, the environment, wildlife and domestic animals, cultural resources, hydrologic balance, and extant riparian and wetland areas, including reclamation of any streams that may be impacted by the mining operations.
- Protect the quality of surface and groundwater resources by minimizing pollutant formation and on-site containment of any unavoidable toxicity.

- Preserve suitable topsoil and other approved topdressing material for use in reclamation by employing appropriate technologies and BMPs for sampling, testing, replacement, and stabilization.
- Establish surface soil conditions most conducive to regeneration of a stable plant community through stockpiling, and reapplication of alluvial or soil material where feasible.
- Revegetate and stabilize disturbed areas with a diverse mixture of appropriate plant species in order to achieve a self-sustaining ecosystem.
- Maintain public safety and site stability through appropriate recontouring and revegetation of disturbed areas within the mine area.

After completion of mining and processing, surface facilities, equipment, and buildings related to the mining project would be removed, foundations broken and removed from public land, and the plant site returned to conditions similar to those present before reestablishment of the mine. The topography, slopes, and aspects of the disturbed and reclaimed areas would conform to the present, existing physiographic forms of the Copper Flat area.

2.1.15.5 Implementation

Contemporaneous reclamation would be conducted on disturbed areas not to be re-disturbed by future mining operations. Both public and private land would be reclaimed. Upon completion of mining activities, the site would be restored in accordance with the restoration and reclamation plan. The reclamation and restoration must be demonstrated to be sustainable without perpetual care. Closure of the site would be accomplished by the following activities:

- **Pre-construction and permitting:** In this stage, baseline data is collected to characterize the existing environment.
- **Construction:** Where feasible, the existing soils and suitable alluvial material would be removed first from major disturbance areas (TSF, waste rock disposal areas, etc.), then stockpiled, protected, and used in the reclamation and restoration process. The revegetation test program would be initiated during this phase of the operation.
- **Operations:** Reclamation and restoration efforts would be implemented at the earliest feasible time in areas where activities are discontinued. This includes recontouring; scarifying; placement of soil, alluvial material, and other approved topdressing material; and revegetation. The revegetation test program and concurrent reclamation would be monitored during this phase to provide data that would be utilized to determine final closure methods to be implemented to achieve reclamation and restoration goals and pre-determined plans, subject to regulatory approval.
- **Closure:** Upon closure of the mining operations, facilities would be reclaimed according to the reclamation plan.
- **Post-closure monitoring:** Following the completion of reclamation and closure activities, revegetation would be monitored for at least two growing seasons and would meet Part 6 requirements under the New Mexico Mining Act. Groundwater would be monitored according to conditions set forth in the groundwater DP, which was prepared by NMCC for submission to NMED and is currently undergoing technical review.

2.1.15.6 Environmental Considerations for Reclamation

Signs, Markers, and Safeguarding: Measures such as signs, markers, fences, and barricades would be used to protect the public, wildlife, and domestic animals from potentially dangerous areas associated with the project.

Wildlife and Domestic Animal Protection: Reclamation of the Copper Flat project would be conducted to achieve a stable configuration, and access to the site would be restricted for protection of the public and animals. The project would result in the reclamation of over 910 acres of land disturbed by previous mining activities.

Cultural Resources: Cultural resources requiring protection and any cemeteries or burial grounds would be protected or avoided during reclamation activities. This includes any resources identified before or during project activities.

Hydrologic Balance:

- **Acid Rock Drainage (ARD):** Partially oxidized transitional waste rock would be managed and reclaimed to alleviate potential ARD. The transitional waste rock may be segregated and placed in the west and north waste rock disposal areas. The exact method of disposal and possible segregation would be determined though the current geochemical testing program and the development of a material handling plan. To minimize oxidation post-closure, waste rock would be placed in an engineered WRDF (NMCC 2014a). The WRDFs would be contoured to enhance runoff; covered to reduce infiltration; and reclaimed by regrading. This would be done with a dozer compacting the surface and covering this surface with up to 36 inches of growth media or topsoil (or as may be allowable under State statutes). The WRDFs containing transitional material would be located adjacent to the pit.
- **Suspended Solids:** Sediment control would be achieved by the use of BMPs including regrading, seeding and mulching, silt fences, straw bale dams, diversion ditches with energy dissipaters, and rock check dams at appropriate locations during construction and operation. Diversion structures, including existing structures, would divert run-on away from disturbed areas. All sediment control structures would be monitored and maintained on a regular basis. During operations, all runoff from the plant site would be directed into a sediment pond located on the east side of the site adjacent to the make-up water pond. Following reclamation, all ponds would be regraded to prevent holding water, surfaces covered with growth media, and vegetated.
- **Diversions and Overland Flow:** The surface drainage of the mine area was designed to contain or control the 100-year/24-hour storm event. During reclamation, most areas would be regraded and, where possible, the original drainages restored. The diversion of surface water runoff around the waste rock disposal areas would remain in place. Ditches would be lined with riprap as needed to protect the channels from erosion.
- **Stream Diversions:** The watershed area to the west of the pit is drained by Greyback Arroyo, an ephemeral stream that is dry over most of its length except during the rainy season. Greyback Arroyo used to pass through the pit area. This drainage has been intercepted, diverted around the southern periphery of the pit, and returned to the original channel east of the pit area. This was accomplished by cutting a channel through the ridges and placing diversion dams in the tributary arroyos. Following closure of the previous operation, the diversion was left in place. The diversion would be left in place following closure of the proposed operation.

- **TSFs:** The TSF would be designed, constructed, and maintained to prevent adverse impacts to the hydrologic balance and adjoining property, and to assure the safety of the public and wildlife.

Prevention of Mass Movement: All slopes, TSF embankments, and WRDFs would be designed, constructed, and maintained to prevent mass movement during operations and following closure.

Riparian Areas: The riparian areas south and east of the proposed plant area are in the existing Greyback Arroyo channel. The Proposed Action does not change the flow of water through the diversion channel and Greyback Arroyo.

Roads: Access to the site is via an existing county road (Gold Dust Road/County Road 27), which would remain following closure. Prior to final closure, the State of New Mexico and the BLM would determine which other roads would be left intact around the site in order to conduct post-closure monitoring or provide adjacent landowner access. All other NMCC mine-related roads would be reclaimed.

Surface Facilities or Roads Not Subject to Reclamation: A number of pre-1981 primitive roads exist within the proposed mine area. Some of these roads would not be utilized during the currently proposed operation and therefore are not subject to reclamation by NMCC.

Drill Hole Plugging and Water Well Abandonment: Mineral exploration and development drill holes, monitoring, and production wells subject to State regulations would be abandoned in accordance with applicable rules and regulations (NMAC 19.27.4 et seq.). Borings or wells that penetrate a water-bearing stratum would be plugged under the terms of an NMAC 19.27.4 OSE-approved Well Plugging Plan of Operations, which typically calls for the placement of a column of sealant from maximum depth to ground surface to prevent cross contamination between aquifers and to prevent contamination by surface access. Monitoring wells around the TSF would be maintained until NMCC is released from this requirement by the NMED, MMD, and the BLM. These wells would then be plugged and abandoned according to applicable requirements.

2.1.15.7 Post-Closure Monitoring

Monitoring would be ongoing throughout the life of the operation, during closure, and for a post-closure period. The post-closure monitoring period includes final abandonment of monitoring wells (ROW Grant #NMNM 125870) and reclamation of access roads needed for monitoring (NMCC 2014a). The BLM and State agencies would set post-closure monitoring requirements at mine closure. Sampling of the water in the pit after mine closure would continue for a period that is established by consultation with the NMED to determine any changes in pit water quality. The tailings dam/pond would be regulated by the OSE for safety of operations. A DP that requires monitoring for seepage into the groundwater would be required from the NMED Ground Water Quality Bureau. Following closure, water samples from monitoring wells located downstream of the tailings dam and in the plant and pit area would be taken and analyzed on a regular basis and the results sent to the Ground Water Quality Bureau in accordance with monitoring requirements set forth in the DP. These samples would identify any seepage from the tailings pond or other mine units at the facility that have the potential to impact groundwater quality. The DP would contain contingency requirements that would address groundwater exceedances resulting from leakage from the tailings dam and, if necessary, require an abatement plan to address groundwater exceedances.

2.1.15.8 Site Stabilization and Configuration

The mine area would be stabilized, to the extent practicable, to prevent future impact to the environment and protect air and water resources. All facilities, slopes, embankments, and roads would be designed, constructed, maintained, and reclaimed to achieve stable configurations. The topography, slopes, and aspects of the disturbed areas would be developed to blend in with the surrounding topography as much as practicable. All drainage channels, ditches, and earthen water control structures would be revegetated to the extent practicable. Additionally, riprap, sediment traps, or other types of BMPs would be utilized as needed to prevent erosion. Alluvial materials suitable for surface treatment would be salvaged from disturbed areas where safe and feasible operation of earthmoving equipment is possible and would be stockpiled and protected for use in reclamation.

2.1.15.9 Plant Growth Media and Cover Materials

Removal and Storage: Suitable soil material available for reclamation from the previously mined and disturbed areas at the mine area is very limited. Where salvageable soil exists either on undisturbed or reclaimed areas, NMCC would salvage as much material as can be safely and practically recovered. The lack of reclamation cover material available from previously disturbed areas and the poor development of topsoil (top dressing) at the site would require the evaluation of alternative sources and types of materials for use as reclamation cover. The estimated volumes of salvageable cover material available in areas to be newly disturbed or re-disturbed by the project are shown in Table 2-5, above.

NMCC plans to salvage the near-surface alluvial materials from within the limits of the TSF to cover the identified soil deficit to meet reclamation cover requirements.

Diversion ditches would be constructed and maintained around the reclamation material stockpiles to prevent run-on erosion. They would be seeded with an interim, weed-free seed mix. Seeding is typically done once, right before the monsoon season. Efforts would be made to salvage the existing vegetation on the areas that would be newly disturbed by the project. Prior to and during soil salvage, woody plants and vegetation would be removed. The vegetation would be stored with the growth media to increase the organic matter content of the growth media.

Placement: The goal is to salvage sufficient growth media and alluvial material to provide required cover on areas to be revegetated. Table 2-12 shows the required cover volumes by specific disturbed areas. The final details of the placement and use of these materials in reclamation would be approved by the State and the BLM following analysis of the results of a test-plot program that would be conducted during the mining operation. To ensure good contact with the subsoils, the surface would be roughened by ripping or disking prior to placement of the cover material. The cover material would be spread and graded with care taken to prevent a reduction in bulk density by limiting the number of passes. Following placement, the area would be graded with a dozer to lightly compact the soil.

Amendments: Soils and alluvial materials to be salvaged for reclamation cover are deficient in nitrogen, phosphorus, and potassium and would require 4,000 to 8,000 pounds per acre of amendments to create fertile growth media. Aerobically digested sanitized sewer sludge, cotton husks, and feedlot cattle waste are possible natural materials that might be used, if available, to amend the growth media prior to placement on reclaimed areas. Composting of materials, if required, would be performed on-site to better control the rate and amount of composting. Any natural soil amendments used would be certified free of invasive and noxious weeds. Repeated applications may be required based upon additional testing and vegetation monitoring.

Table 2-12. Estimated Reclamation Cover Requirements

Table 2-12. Estimated Reclamation Cover Requirements			
Facility	**Surface Area (Acres)**	**Top Dressing Cover Requirements (yd^3)**	**Reclamation Cover Requirements (yd^3)**
West WRDF	16.3	13,151	65,755
North WRDF	69.9	56,400	282,005
East WRDF	122	99,072	495,360
Low-grade stockpile	64.3	54,611*	--
Plant area	78.0	62,920	--
TSF	547.0	438,000	2,062,509**
Roads & miscellaneous	50.0	40,333	--
Total	**947.5**	**764,487**	**2,905,629**

Notes: * The low-grade stockpile does not require reclamation cover as it is anticipated to be processed and removed at the end of mining; however, the disturbance footprint of the stockpile would require some top dressing in order to facilitate revegetation.

** No areas unaffected by construction and mining activities are currently proposed to be disturbed in order to obtain reclamation cover materials. Several borrow areas currently existing within the limits of the TSF would be the primary source of the excavated materials. Mine haul trucks and front-end loaders would be used to remove the required materials during the construction period and stockpile it in designated locations. These locations were chosen to reduce haul distances and to limit erosion. The stockpiles would be constructed with 3H.0:1V slopes. The different aspects and slopes of the stockpiles would be used in the test revegetation program to evaluate slope revegetation methods.

Revegetation: The revegetation plan is designed to create a stable, self-sustaining plant community and would be in conformance with the planned post-mining land uses of wildlife and grazing. The dominant biotic community of the Copper Flat area is Chihuahuan desert scrub (often dominated by creosote bush).

To achieve the post-mining land use of wildlife and grazing, revegetation of the site would consist mainly of the establishment of grass and shrub species characteristic of the desert grassland community. Appropriate native riparian and hydrophilic plant species (willows, cottonwood, cattails, sedges, etc.) shall be planted in shallow areas near the shoreline of the pit lake after mining is complete.

Seed Mixtures: The seed mixtures and any plants used for any purpose, including reclamation, would be determined by seed availability, compatibility with the vegetation of the surrounding areas, soil and climatic conditions of the area, and by recommendations from the BLM and NMEMNRD. The seed mixes shown in Table 2-13 are example seed mixes derived from information provided by the BLM and NMEMNRD for revegetation programs in the vicinity of the project. The species included in the list also focus on those that are more readily available.

Planting Techniques: Seeding would take place prior to the traditional monsoon season. Compacted soils would be ripped or scarified to a depth of 6 to 12 inches prior to seeding. The types of seeding employed, drill or broadcast would be determined by consideration of seed type, soil type, moisture content, and other factors.

Revegetation Success: Revegetation success would be determined by monitoring the vegetation parameters of ground cover, productivity, woody plant density, and plant species diversity.

Table 2-13. Proposed Reclamation Seed Mixes

Species	Application Rate (lbs/acre)
Drill Seed Mix	
Blue grama (*Bouteloua gracilis*)	0.6
Side-oats grama (*Bouteloua curtipendula*)	1.3
Indian ricegrass (*Oryzopsis hymenoides*)	1.2
New Mexico feathergrass (*Stipa neomexicana*)	1.0
Tobosa grass (*Pleuraphis mutica*)	1.2
Black grama (*Bouteloua eriopoda*)	0.6
Cane bluestem (*Bothriochloa barbinodis*)	1.0
Narrowleaf globemallow (*Sphaeralcea angustifolia*)	0.5
Four-wing saltbush (A*triplex canescens*)	0.8
Broadcast Seed Mix	
Blue grama (*Bouteloua gracilis*)	0.6
Side-oats grams (*Bouteloua curtipendula*)	1.0
Sand dropseed (*Sporobolus cryptandrus*)	0.5
New Mexico feathergrass (*Stipa neomexicana*)	1.0
Silver bluestem (*Bothriochloa laguroides*)	1.0
Apache plume (*Fallugia paradoxa*)	1.0
Four-wing saltbush (*Atriplex canescens*)	1.0
Blanket flower (*Gaillardia pulchella*)	0.5
Narrowleaf globemallow (*Sphaeralcea angustifolia*)	0.1

Reclamation Research: As part of the reclamation plan, NMCC would conduct a revegetation test program to determine the most effective methods to meet revegetation standards as defined in their reclamation plan.

Concurrent Reclamation: As part of the Proposed Action, NMCC would periodically review areas disturbed by the operation and complete concurrent reclamation, including grading and revegetation, of areas no longer necessary for operation or areas expected to remain inactive for a significant period of time to limit blowing dust and potential erosion (NMCC 2014a).

Interim Reclamation: There is a possibility that continuous, full-scale production might be interrupted for short periods in response to economic considerations or unforeseen circumstances. In this event, interim reclamation would be initiated as outlined below:

- **ROWs:** Power lines and the water pipeline would be inspected regularly and maintained as necessary. None of the facilities would be altered or removed. The main access road would receive regular maintenance. The internal roads would receive minimal maintenance.
- **Pit:** The pit area would be protected by fencing with a locked access gate. Monitoring of pit water would be ongoing.
- **Tailings Facility:** The TSF would be retained for potential future development. Limited care and maintenance of the reclaimed embankment face would be performed as necessary to continue stabilization of the area.
- **Diversion Ditches:** Diversion ditches would be inspected and maintained as necessary. Surface water runoff would be managed in accordance with the site's DP requirements.

- **Buildings:** The process buildings, equipment, and support facilities would be guarded by an on-site resident security guard and maintained as necessary. None of the buildings would be destroyed or modified.

2.1.15.10 Interim Management Plan

In accordance with 43 CFR 3809.401(b)(5), NMCC has prepared the following interim management plan to manage the mine area during periods of temporary closure (including periods of seasonal closure, if necessary) to prevent unnecessary or undue degradation. This plan includes:

- Measures to stabilize excavations and workings;
- Measures to isolate and control toxic or deleterious materials;
- Provisions for the storage or removal of equipment, supplies, and structures;
- Measures to maintain the mine area in a safe and clean condition; and
- Plans for monitoring site conditions during periods of non-operation. A schedule of anticipated periods of temporary closure during which the interim management plan would be implemented, including provisions for notifying the BLM of unplanned or extended temporary closures.

2.1.15.11 Schedule of Operations

The standard operating schedule at the Copper Flat project would be 24 hours a day, 365 days a year for the mining activities and processing circuits. No temporary or interim closures of the facility are currently planned. It is possible that, due to various mechanical, technical, economic, legal, or other unforeseen events, mining and processing facilities would have to be temporarily closed. In the event of an unplanned temporary closure, the following plan would be implemented:

- The BLM, MMD, and the NMED would be notified within 30 days of the temporary closure of the flotation mill or the concentrate circuit.
- NMCC would supply the BLM, MMD, and the NMED with a list of supervisory personnel who would oversee the mine facility during the temporary closure period.
- If the interim closure period exceeds 180 days, NMCC would either apply for standby status or would begin to evaluate procedures required to carry out a permanent closure of the process components.

2.1.15.12 Measures to Stabilize Excavations and Workings

No additional measures would be necessary to stabilize excavations and workings during an unplanned temporary closure. Pit dewatering activities may cease during the temporary closure period, in which case all dewatering pumps, pipelines, and water storage tanks would be drained. Interim reclamation procedures would be implemented as necessary to stabilize disturbed sites during the temporary closure period. These procedures would be coordinated with the BLM, MMD, and the NMED. Adequate storage capacity would be maintained in the process components to accommodate runoff resulting from the design-level storm event.

2.1.15.13 Measures to Isolate or Control Toxic or Deleterious Materials

NMCC would follow the waste rock management procedures described in the MPO to isolate waste rock as necessary during an unplanned temporary closure.

2.1.15.14 Storage or Removal of Equipment, Supplies, and Structures

In the event of a temporary closure, it is anticipated that equipment, supplies, and structures would not be removed or placed into storage. In addition, the following steps would be taken:

- Additional reagents would not be introduced into any process component during the temporary unplanned closure period. Process piping and pumps would be drained if the process circuits are shut down. Stored equipment would be clearly identified as having contained process solutions.
- Any mine equipment remaining in operation during the temporary closure, including haul trucks, shovels, loaders, drills, and personnel vehicles would continue to be maintained according to standard company procedure.
- Following any temporary closure period, the integrity of the entire fluid management system would be evaluated before startup is initiated. Solution tanks, pumps, and piping would be visually inspected and repaired as necessary. The mineral processing circuit would be charged with process solution and visually inspected for evidence of leaks. Mine equipment would be inspected for compliance with appropriate Federal and State mining regulations before mining activities recommence. Upon reopening, it is unlikely that mining activities would be affected by a temporary closure. The mine dewatering system would be visually inspected and repaired as necessary. Pit dewatering would resume as soon as possible.

2.1.15.15 Monitoring During Periods of Non-Operation

All provisions of this plan and all other regulatory and permitting requirements would continue to be met during the temporary closure period.

2.1.15.16 Facility-Specific Reclamation

Mine Pit: NMCC does not propose to backfill the pit. Groundwater inflow formed a lake in the former pit. The current water level is at about 5,439 feet; therefore, pit dewatering would be necessary during operations. Following cessation of dewatering activities, a lake would again form in the pit. The post-closure pit water elevation is estimated to be approximately 4,900 feet. The depth of the lake would fluctuate a few feet depending on precipitation and the evaporation rate. If natural refilling were to be selected, this would proceed over a number of years. Rapid filling, proposed as mitigation, would occur much more quickly. This would occur under conditions of water right approval to quickly submerge mineralized wallrock and limit mineral oxidation and formation of soluble mineral residue. Reclamation of the pit during operations would be limited to erosion control and maintaining slope stability.

At closure, stable pit walls would be left in place, and unstable pit walls would be stabilized by blasting or other safe methods. In those areas where pit benches could be safely accessed with the appropriate equipment, alluvial material would be placed on the benches above the projected water level and the benches would be graded and seeded to limit erosion. Roads would be ripped and water barred to control surface water runoff. Disturbed areas around and adjacent to the pit would be covered with alluvial material and revegetated. The ramp would be graded or ramps placed at different locations to allow escape routes for wildlife. The pit area and high walls would be appropriately barricaded with physical barriers or fences and posted according to MSHA and New Mexico State Mine Inspectors Office regulations. Access would be limited by a locked gate and the access road blocked with a physical barricade.

NMCC must design a pit reclamation plan that would meet BLM requirements in CFR 3809.420, including a post-mining land use consistent with applicable BLM land use plans, operations that comply with all pertinent Federal and State laws, and reasonable measures to control on-site and off-site damage of Federal land. NMCC pit reclamation must adhere to MMD requirements in NMAC 19.10.6, including the achievement of a self-sustaining ecosystem appropriate for the life zone of the surrounding area. MMD pit reclamation requirements also include stabilization, to the extent practicable, to minimize future impact to the environment and to protect air and water resources. Per NMAC 20.6.4, water in the pit after mine closure would be required to meet applicable State surface water standards.

The proposed post-mining land use for the pit is wildlife habitat. After mine operation, the benches and walls of the pit would be stabilized, the overall pit slope would be maintained, and the pit would be about 900 feet deep. The bottom of the pit would naturally fill with water to a steady-state depth of about 200 feet, leaving about 700 feet of high walls and benches. The pit walls and benches would become Chihuahuan Desert wildlife habitat, providing abundant rock outcroppings, which are regularly utilized by bats for day or night-roosting, or for cliff-dwelling bird species such as raptors for nesting. Supporting the perennial nature of the pit water source and maintaining water quality consistent with wildlife use would allow wildlife found at or near Copper Flat to rely on this available habitat. Pit reclamation may follow one or more of the following strategies:

- "Rapid fill" of the pit would bring the pit water to a steady-state water level elevation in less than a year through the addition of groundwater from the mine production wells, rather than the many years it would take for the pit water elevation to rise to this level if it were to refill naturally. Additional details for the rapid fill scenario include the following:
  a. Rapid fill would occur by pumping the mine production wells at approximately 3,000 gpm for about 7 months. Water would be pumped into the bottom of the pit via a temporary HDPE pipe laid along the haul road. The total pumped volume would be about 2,800 AF.
  b. Rapid fill from groundwater would introduce good quality water, dilute solutes derived from water-rock interaction, submerge walls and benches to limit the exposure of sulfide minerals to oxygen to inhibit oxidation, stabilize pit water quality, and create a steady-state condition for a hydraulic sink in the near term rather than waiting for natural refilling of the pit. Initial pit water chemistry would be composed of 98 percent supply well water and 2 percent stormwater runoff from the pit shell.
  c. The rapid fill scenario pumping would be close to the pumping rate employed during mine operation; therefore, there would be no change to the predicted final drawdown. Recovery of water levels would be delayed for 6 months to a year.
  d. NMCC would plan the rapid fill pumping rate to not exceed its allowed water rights.
- Reclamation of disturbed areas in the watershed surrounding the open pit would be accomplished to minimize infiltration and promote vegetative growth. This proposed reclamation measure would create a store and release cover, minimize infiltration of storm water around the pit perimeter, and limit water–rock interaction in the upper pit walls.
- A controlled pathway would be provided for the pit watershed area to direct excess runoff to the pit bottom to protect water quality and prevent erosion. Additional water collected in the pit through storm events would provide dilution of naturally occurring constituents. Additional details for the controlled pathway scenario include the following:
  a. Reclamation of the 90-foot-wide haul road within the open pit would occur through the installation of a stormwater conveyance system along the haul road. Other reclamation measures that would be employed would include erosion control features, potentially a compacted base on exposed haul road area, and seeding for natural revegetation where appropriate. Haul road reclamation would be performed in stages prior to and after rapid filling:

   i. The first stage would likely include removal of loose material, installation of storm water controls, and lining a stormwater conveyance system.
   ii. After rapid filling, the second stage of haul road reclamation would include localized placement of substrate (if needed) and revegetation. Access would be prohibited except for maintenance, monitoring, or emergency purposes.

- During the initial stage of the rapid fill scenario, vehicle access to the pit would be limited to only vehicles and equipment needed for reclamation work and monitoring. In the second stage, vehicular access would be further restricted, through the placement of berms, to only that which is necessary for monitoring or emergencies. Signs to provide notice of no access would be located around the perimeter of the pit. Wildlife would have access to and from the pit via the haul road. Surface features would be designed such that wildlife could not become trapped in the pit.

Waste Rock Disposal Areas and Low-Grade Stockpile: The primary WRDF for the Proposed Action is located east-northeast of the millsite on the east side of Animas Peak. Two smaller WRDFs would be located adjacent to the pit. The waste rock disposal areas would be regraded and reclaimed to blend into the surrounding topography to the extent practicable. Horizontal surfaces would be regraded and contoured to reduce infiltration of water and provide positive drainage to sediment collection points. Partially oxidized waste rock represents some of the material in the existing west and north WRDFs. All the WRDFs and any low-grade ore remaining in the low-grade ore stockpile would be reclaimed in a manner that has been determined to reduce infiltration and to alleviate the long-term risk of acid generation and metals leaching. Following regrading, the surface of the disposal areas would be consolidated with earthmoving equipment and covered with a layer of alluvial material and revegetated. Waste rock disposal areas would be covered with suitable reclamation materials and revegetated contemporaneously as practicable with the operations.

Diversion structures would be revegetated to the extent practicable. Additionally, riprap would be used as needed to reduce erosion and left in place following closure. The low-grade ore stockpile is located immediately north of the process plant area and would include about 19 million tons of rock assaying lower than 0.20 percent copper. If the low-grade ore stockpile is milled by the end of mine life, the pad area would be ripped, contoured for drainage control, covered with growth media, and revegetated. If the low-grade stockpile remains following closure, the stockpile would be reclaimed in the same manner as the WRDFs; it would be regraded to overall slopes of 3.0H:1.0V and shaped to enhance runoff, prevent infiltration, and ponding. The surface would be consolidated with earthmoving equipment, covered with a layer of alluvial material, and revegetated.

Plant Site: At closure, all surface facilities, equipment, and buildings would be removed from the area. For buildings located on public land administered by the BLM, the concrete foundations would be broken, excavated, and disposed of in a suitable location on adjacent private land. The concrete building slabs, footings, and foundations for facilities located on private land controlled by NMCC would be broken, covered with waste rock material and available growth media, regraded, and revegetated. All fuel tanks and reagent storage facilities would be removed from the site according to applicable Federal and State laws. The general surface area would be shaped and contoured for surface drainage control and covered with a minimum of 6 inches of stockpiled alluvium/growth media to conform to the surrounding topography to the extent practicable. The tailings thickener and tailings reclaim pond would be backfilled and regraded to eliminate ponding prior to placement of alluvial material/growth media and revegetation. After closure, the stormwater pond located east of the plant site would be removed, regraded, revegetated, and opened to drain to Greyback Arroyo (NMCC 2014a).

The land bridge that conveys the tailings pipeline would also be left in place because this feature may be a contributing factor to the development of the riparian zone along Greyback arroyo on either side of the land bridge. The slopes of the land bridge would be stabilized and the top revegetated during reclamation.

TSF: A TSF located southeast of the plant site was designed to hold a total of 95 million tons of tailings (including tailings from 11 million tons of low-grade ore). Closure of the TSF would include:

- Final grading of embankment outslopes to establish erosion controls and control surface water drainage (BMPs);
- Placement of a soil or rock cover and revegetation of the embankment outslope;
- Placement of riprap and erosion controls on the embankments of surface water drainage structures;
- Regrading or depositional modification of the TSF surface to promote drainage to a permanent engineered spillway;
- Placement and vegetation of a soil cover over the tailings surface;
- Armoring of surface drainage channels and implementation of BMPs for erosion control; and
- Management of underdrainage.

During ore processing, solution reporting to and flowing from the TSF underdrain collection pond is projected at 1,200 gpm. When processing and tailings deposition ends, the free water pond remaining at the top of the TSF would be evaporated to eliminate the largest source of draindown solution, and solution flow through the TSF underdrain system would reduce to approximately 800 gpm approximately 9 months after processing shutdown. After that time, draindown from the TSF would continue to decline at a steady rate. Draindown solution would be collected in the TSF underdrain collection pond, from which it would be pumped to the top of the TSF to be evaporated or used as reclamation cover irrigation if the water is of suitable quality. If the draindown solution is not suitable for reclamation cover, a portion of the TSF would be left un-reclaimed and uncovered for evaporation operations. When the draindown flow rate reached a very low level, estimated to require 3 to 5 years following process shutdown, and with the approval of the appropriate New Mexico regulatory agencies, a passive evapotranspiration system would be installed at the bottom of the TSF to eliminate final draindown flows. At this point, the seepage collection pond would be decommissioned and reclamation of the TSF completed.

Final grading of the TSF surface would be accomplished with earthmoving equipment or through modification of tailings disposal patterns during the final years of operation. Tailings discharge from selected locations would be used to relocate the supernatant pool to a location adjacent to the post-closure spillway. This would reduce grading requirements and limit earthmoving operations in areas where working conditions are expected to be difficult due to the presence of soft and saturated tailings. At the location of the spillway, a bedrock foundation is anticipated. If the spillway channel is erodible, grouted riprap or other erosion controls would be applied.

Ancillary Project Facilities: All surface pipelines, poles, and commercial signage would be removed. At time of closure, the BLM would determine whether buried pipelines and electrical conduits would be left in place.

Fences: The tailings and mine area would be fenced to discourage access by people, wildlife, and livestock for safety purposes. Fences used to restrict access to potentially hazardous areas would remain in place. The BLM would determine which fences would remain intact on public land. All fencing on public land would be constructed to meet BLM requirements.

Water Tanks: The fresh water and process water tanks would be removed, their foundations buried in place, and the side-hill cuts recontoured to approximate the original topography. Following recontouring, the areas would receive alluvial material if the replaced fill material would not support vegetation. The areas would then be revegetated.

Roads: A portion of the access road has been deeded to Sierra County and provides access through the mine area to private and public property adjacent to the west boundary of the project. From the point where the mine access road leaves the county road north of the TSF, it would be narrowed to a standard two-lane road. One culvert, located where the road crosses Greyback Arroyo, would be left in place. Prior to final closure, the State and the BLM would determine which auxiliary roads and haul roads would be left intact. Roads to be reclaimed would be recontoured to approximate the original topography if constructed on sidehills or contoured and ripped if constructed in flat areas. Water bars would be constructed to reduce erosion. Recontoured areas would be covered with alluvial material if replacement fill material would not support vegetation. These recontoured areas would also be revegetated.

Electrical Power: Power for the project would be furnished by means of existing overhead power lines. The overhead lines would be removed from the millsite and disconnected from the 115-kV line owned by Sierra Electrical Cooperative by removing the wires of the last span of the line. Pumping stations and electrical substations on the site would be removed if no other post-closure land use is identified and approved. The disturbance associated with removal would be reclaimed by regrading and seeding. If renewable energy facilities are deployed at specific buildings, these would be removed and associated disturbances would be regraded and reseeded. The existing 25-kV line that provides power to the production wells, pumping stations on the fresh water pipeline, and reclaim water pump stations at the tailings dam would remain in place.

Water Supply: Water would be supplied to the mine from four production wells located about 8 miles east of the plant site. A 20-inch welded steel pipeline transports the water to the mine and is buried at a minimum depth of 2 feet from the well field to the point of entry to the mine area. The buried pipeline is owned by the BLM. The BLM would determine upon closure whether the buried pipeline would remain in place. All roads and power lines for the production wells are in place. The BLM would determine whether the well area would remain as it currently exists after closure of the mine.

Sanitary Solid Waste Disposal: At closure, the system used to treat domestic wastes would be dismantled and removed, and the area would be regraded and vegetated in accordance with site closure plans (NMCC 2014a). If a private landfill is permitted for on-site disposal of solid waste, the landfill would be closed according to NMED requirements.

Reclamation Bond: A reclamation bond is required by the BLM and State of New Mexico to guarantee completion of project reclamation (43 CFR 3809.500-3809.599).

2.1.16 Environmental Protection Measures

In addition to mine operations and reclamation actions described elsewhere in this chapter, NMCC would commit to the following practices to prevent unnecessary environmental degradation during the life of the project. These practices, described briefly below, are to be considered part of the Proposed Action and the operating plan and procedures. More detailed information would be developed as the project is advanced to more detailed design stages.

Air Quality: The Copper Flat project would be designed to control both gaseous and particulate emissions and to meet all regulatory standards. Appropriate air quality permits would be obtained from the NMED Air Quality Bureau for the proposed project facilities and land disturbance. As per NMED regulations, the project air quality operating permit must be authorized by the NMED prior to project commissioning. The NMED Air Quality Bureau issued a New Source Review Permit to NMCC dated June 25, 2013.

Committed air quality practices would include dust control for mine unit operations. In general, the fugitive dust control program would provide for water application on haul roads and other disturbed areas; chemical dust suppressant application (such as magnesium chloride) where appropriate; and other dust control measures as per industry practice. Also, disturbed areas would be seeded with an interim seed mix to limit fugitive dust emissions from unvegetated surfaces where appropriate. Drilling operations would be done wet or with other efficient dust control measures as set by MSHA, the New Mexico State Mine Inspector’s Office, and New Mexico mining and exploration permit requirements (NMCC 2014a).

Fugitive emissions in the process area would be controlled at the crusher and conveyor drop points through the use of water sprays and dry cartridge filter-type dust collectors where necessary. Other process areas requiring dust or emission controls include the concentrate drying and packaging circuit, various process plants, and laboratory. Appropriate emission control equipment would be installed and operated in accordance with the construction and operating air permits. The lime storage would be fitted with a baghouse for capture of fugitive dust during loading of the lime bin. The sample preparation lab would be equipped with fans and filters.

Deposition of tailings would be by dispersion spigots or cyclone discharge. Using this procedure, the surface would be wet, thereby eliminating or reducing fugitive dust. As necessary, control of fugitive dust in the vicinity of the tailings pond would be attained by watering, sprinkling, and vegetation. No gaseous contaminants above allowable standards are expected to be emitted to the atmosphere from the proposed operations.

Combustion emissions would result from the mobile mining machinery and support vehicles. All combustion equipment emits nitrogen dioxide and carbon monoxide. The mobile mining equipment is diesel-fueled and would also emit particulate matter. Combustion emissions would be controlled by original equipment manufacturer pollution control devices. Fugitive emissions from ore and the flotation equipment are expected to be small due to the low volatility of the sulfur compounds present in the concentrate.

Water Resources: Process components would be designed, constructed, and operated in accordance with NMED regulations. The proposed process facilities would be zero discharge, and the TSF facilities would have engineered liner systems. Waste rock with the potential to generate acid or mobilize deleterious constituents would be determined through the current geochemical testing program and the development and execution of a NMED-approved waste management plan.

Erosion and Sediment Control: BMPs would be used to limit erosion and reduce sediment in precipitation runoff from proposed project facilities and disturbed areas during construction, operations, and initial stages of reclamation. BMPs that would be used during construction and operation to limit erosion and control sediment runoff would include:

- Surface stabilization measures — dust control, mulching, riprap, temporary and permanent revegetation/reclamation and restoration, and placing growth media;
- Runoff control and conveyance measures — hardened channels, runoff diversions; and

- Sediment traps and barriers check dams, grade stabilization structures, sediment detention, and sediment/silt fence and straw bale barriers.

Revegetation of disturbed areas would reduce the potential for wind and water erosion. Following construction activities, areas such as cut and fill embankments and growth media/cover stockpiles would be seeded as soon as it is practicable. Contemporaneous reclamation would be conducted on disturbed areas not to be re-disturbed by future mining operations. All sediment and erosion control measures would be inspected periodically and repairs performed as needed.

Wildlife: Land clearing and surface disturbance would be timed to prevent destruction of active bird nests or birds' young during the avian breeding season (March 1 to August 31) to comply with the Migratory Bird Treaty Act. If surface disturbing activities are unavoidable during the avian breeding and nesting season, NMCC would have a qualified biologist survey areas proposed for disturbance for the presence of active nests immediately prior to the disturbance. If active nests are located, or if other evidence of nesting is observed (mating pairs, territorial defense, carrying nesting material, transporting of food), NMCC would work with the biologist and the BLM to develop a work plan to allow construction activities to continue without impacting the identified nesting area during the nesting and breeding season.

Operators would be trained to monitor the mining and process areas for the presence of larger wildlife such as deer and antelope. Mortality information would be collected. NMCC would establish wildlife protection policies that would prohibit feeding or harassing wildlife.

Cultural Resources: Avoidance is the BLM-preferred management response for preventing impacts to historic properties (a historic property is any prehistoric or historic site eligible for the National Register of Historic Places) or unevaluated cultural resources. If avoidance is not possible or is not adequate to prevent adverse effects, NMCC would undertake data recovery from such sites. Development of a treatment plan, data recovery, archeological documentation, and report preparation would be based on the Secretary of the Interior's "*Standards and Guidelines for Archeology and Historic Preservation*" 48 CFR 44716 (September 29, 1983), as amended or replaced. If an unevaluated site could not be avoided, additional information would be gathered and the site would be evaluated. If the site does not meet eligibility criteria as defined by Title 36, Code of Federal Regulations, Part 60.4, no further cultural work would be performed. A cultural resources report prepared for the proposed activities within the mine area and further submitted to the State Historic Preservation Officer by the BLM includes a recommendation that a data recovery plan and associated data recovery effort be completed for this project (NMCC 2014a).

Protection of Survey Monuments: To the extent practicable, NMCC would protect all survey monuments, witness corners, reference monuments, bearing trees, and line trees against unnecessary or undue destruction or damage. If, in the course of operations, any monuments, corners, or accessories are destroyed, NMCC would immediately report the matter to the authorized officer. Prior to destruction or damage during surface disturbing activities, NMCC would contact the BLM to develop a plan for any necessary restoration or reestablishment activity of the affected monument. NMCC would bear the cost for the restoration or reestablishment activities.

Health and Safety and Emergency Response: The development of the Copper Flat ore body would comply with environmental and health and safety regulations of all governmental agencies and regulations including MSHA and the New Mexico Mining Act. The State agencies primarily involved are the NMED, the State Mine Inspector's Office (SMIO), MMD, and OSE.

NMED has jurisdiction over ambient air quality, discharges to groundwater, surface water impacts, solid waste disposal, and liquid waste disposal (sanitary facilities). The SMIO and MSHA have jurisdiction over health and safety within the mine; the OSE is concerned with the tailings dam construction and operation and the administration of water rights. The MMD is responsible for issuing a mining permit and is concerned with all issues related to mine operations and reclamation.

As specified under SMIO and MSHA regulations, appropriate dust collection and noise abatement equipment would be installed at the mine. Noise levels in both the mine area and process area would also be subject to MSHA regulations. All drinking water storage vessels would be enclosed in order to preserve the water's potable quality. Within the mine and mill area and the TSF, vehicular traffic and human movement would be controlled through the use of fences, locked gates, signs, and supervisory personnel. Fencing would also discourage access by cattle. Livestock grazing is currently permitted in adjacent properties and would continue during mine operation in adjacent areas.

Fire Protection: As specified by MSHA, NMCC would institute a fire protection training program and have a rehearsed fire suppression plan. A fire protection system would be installed that would incorporate Sierra County and State code requirements in the administration and warehouse complexes, truck shop, crushing plant, and process plant. Hydrants would be located near all buildings. A 100,000-gallon fire water reserve would be stored in a water storage tank located sufficiently above and near the mill and crushing area to provide adequate water pressure. A fuel break would be constructed around the facilities. Mine water trucks and equipment would be available in the event of a fire. An ambulance would be located on-site in the event emergency transportation is required. NMCC would promptly comply with any emergency directives and requirements of Sierra County and the BLM pertaining to industrial operations during the fire season.

Invasive, Non-native Species: NMCC recognizes the economic and environmental impact that can result from the establishment of noxious weed and invasive species and has committed to a proactive approach to their control. Objectives would include:

- Determination of noxious and invasive species currently present;
- Prevention of spread; and
- Prevention of further introduction.

A noxious weed survey would be completed prior to any earthmoving disturbance. Areas of concern for noxious weeds would be flagged by a weed scientist or qualified biologist/botanist to alert all personnel to avoid those areas pending any remediation of the area. Information and training regarding noxious weed management and identification would be provided to all personnel affiliated with the implementation and maintenance of the project.

A noxious weed monitoring and control plan would be implemented during construction and continued through operations. The plan would contain a risk assessment, management strategies, provisions for annual monitoring and treatment evaluation, and provisions for treatment. The results from annual monitoring would be the basis for updating the plan and developing annual treatment programs.

Policies and training would be developed so that personal vehicles and mine equipment that entered an identified noxious week area would be inspected and cleaned. Vehicle cleaning would eliminate the transport of vehicle-borne weed seed, roots, or rhizomes. To eliminate the transport of soil-borne noxious weed seeds, roots, or rhizomes, infested soils or material would be handled in a manner that limits the transport of soil-borne noxious weed seeds, roots, and rhizomes. Appropriate measures would be taken to avoid wind or water erosion of the affected stockpile. All interim and final seed mixes including mulch such as hay, straw, or wood products would be certified weed-free for New Mexico and BLM-identified noxious weeds.

Weed monitoring would be conducted for the life of the operation or until the site is released and the reclamation financial surety is released. If the spread of noxious weed(s) is noted, weed control procedures would be determined in consultation with BLM personnel and would be in compliance with State of New Mexico and BLM handbooks and applicable laws and regulations. Mixing of herbicides and rinsing of herbicide containers and spray equipment would be conducted only in areas that are a safe distance from environmentally sensitive areas and points of entry to bodies of water (storm drains, irrigation ditches, streams, lakes, or wells).

Materials and Waste Management: Operations at the Copper Flat project would result in the generation of nonhazardous and hazardous waste materials. The majority of waste would be mill tailings and waste rock that are currently excluded from regulation under the Resource Conservation and Recovery Act (RCRA). NMCC anticipates that the mine would fall in the "small generator" category (NMCC 2014a). The management of regulated solid and hazardous waste is discussed in the following sections.

Sanitary and Solid Waste Disposal: Nonhazardous solid wastes that would be generated at the site include waste paper, wood, scrap metal, and other domestic trash. A recycling program would be implemented in preference to landfilling nonhazardous solid wastes. NMCC anticipates the recycling program to include clean plastics, paper, cardboard, aluminum, wood, and scrap metal. The amount of recycling would be subject to the availability of off-site programs to receive recycled material. Nonhazardous solid wastes that cannot be recycled would be disposed of in a permitted on-site Class III sanitary landfill on private land, which would be approved by the State of New Mexico or by other methods approved by the State and Sierra County (NMCC 2014a).

Sanitary liquid wastes would be handled by the proposed septic system that would be installed at the mine to accommodate liquid sanitary wastes generated from the mine office, shower, and restroom facilities. The washing facility for the mobile equipment would be equipped with an oil/water separator system. Waste oil and lubricants would be collected and transported off-site by a buyer/contractor for recycling on an as needed basis. Reagent drums would be recycled by the reagent supplier. Scrap metal would be sold to a dealer and transported off-site (NMCC 2014a).

Chemical wastes from the laboratory that exhibit a hazardous waste characteristic, including off-specification commercial chemicals and assay wastes, would be managed as hazardous waste.

Employee training would include appropriate landfill disposal practices such as the allowable wastes that can be placed in the landfill, management of used filters, oily rags, fluorescent light bulbs, aerosol cans, and other regulated substances. Used solvent, liquids drained from aerosol cans, accumulations of mercury fluorescent lights, and used antifreeze may be regulated pursuant to RCRA. Signs would be installed at the landfill sites reminding employees of appropriate disposal practices.

Paleontological Resources: No paleontological resources of critical or educational value have been identified within the proposed mine area. The western half of the mine area lies predominantly in Cretaceous-age andesite formations, which are not conducive to fossil formation because of their origin in a molten, volcanic environment. The eastern half of the mine area is within the Palomas Formation of the Santa Fe Group. The Santa Fe Group is Miocene to Pliocene in age, the same age as the Ogallala Formation in eastern New Mexico, which has produced a variety of mammalian fauna. It is designated as a Potential Fossil Yield Classification (PFYC) 3 area. The Palomas Formation represents two depositional environments forming interpenetrating wedges: alluvial fan deposits from the surrounding uplifts and axial river deposits from the ancestral Rio Grande. Vertebrate fossil localities have been found in the Palomas Formation in the Palomas Basin area. Almost all of them occur in the axial river deposits (Ziegler 2015).

NMCC would immediately notify the BLM Authorized Officer of any paleontological resources discovered as a result of operations. NMCC would suspend all activities in the vicinity of such a discovery until notified to proceed by the Authorized Officer and shall protect the discovery from damage or looting. NMCC may not be required to suspend all operations if activities can be adjusted to avoid further impacts to a discovered locality or be continued elsewhere. The Authorized Officer would evaluate, or would have evaluated, such discoveries as soon as possible, but not later than 10 working days after being notified. Appropriate measures to mitigate adverse effects to significant paleontological resources would be determined by the Authorized Officer after consulting with the operator. Within 10 days, the operator would be allowed to continue construction through the site, or would be given the choice of either: 1) following the Authorized Officer's instructions for stabilizing the fossil resource in place and avoiding further disturbance to the fossil resource, or 2) following the Authorized Officer's instructions for mitigating impacts to the fossil resource prior to continuing construction through the mine area.

Reagent Management: Reagents used as part of the copper/molybdenum concentrating process would include frothers, flotation promoters, flotation collectors, flocculants, flotation reagents, pH regulators, and filter and dewatering aids, as shown in Table 2-14. These reagents would be delivered by truck from commercial sources to the mine area where facilities would be provided for offloading, storing, mixing, handling, and feeding. Reagents that are received dry would be mixed in agitation tanks and pumped to either outdoor storage tanks or liquid storage tanks inside the mill building where they would be metered into the concentrating process. Residual reagent concentrations in the tailings and reclaim water streams are expected to be present at very low levels since they would be added to water in amounts resulting in concentrations of approximately 3 parts per million (ppm). Also, normally 95 percent of the reagents would be adsorbed onto the copper or molybdenum mineral surface and floated off in the mineral froth. The reagent would then be subsequently consumed in the off-site smelting process. Assuming 95 percent of the reagents are absorbed, the residual reagent reporting to the tailings stream drops to less than 0.15 ppm.

Frother reagents to be used at the mine include MIBC. MIBC is biodegradable in low concentrations. The dosage rate would be 0.02 pounds per ton of mill feed. The bulk of this reagent would report to the concentrate fraction and end up at the smelter. The reagent would be received in 20-ton-capacity trucks and stored in a 16,000-gallon tank. Lime used in alkalinity control in the flotation circuit would be received in pebble form in bulk by 20-ton-capacity trucks and stored in a 200-ton-capacity storage silo. The lime would then be slaked with water in a small mill, and the resulting "milk of lime" would be pumped to the addition points in the grinding and flotation circuits for use as a pH regulator. It is anticipated that lime would be used at a rate of 2.7 pounds per ton of mill feed to control the pH of the flotation circuit. During the milling process, most of the lime would react with sulfide minerals to form gypsum.

Either sodium hydrosulfide or ammonium sulfide would be added to the circuit process as a flotation collector and depressant to affect the copper molybdenum separation. These reagents are rapidly oxidized through contact with copper minerals and air bubbles entrained in flotation pulp. These reagents would be transferred from a delivery truck to an appropriate on-site holding tank.

Table 2-14. Copper Flat Project Materials Management

Table 2-14. Copper Flat Project Materials Management				
Reagent	Chemical Abstract Service (CAS #)	Type	Use	Annual Quantity (lbs)
Lime	1305-62-0	Caustic powder; non-combustible solid; incompatible with acids	pH control	15,700,000
Xanthate Z-11/Z-200	140-93-2	Fugitive dust potential	Flotation reagent	58,000
AEROFLOAT 238 (Sodium Hydroxide)	001310-73-2	Caustic alkali liquid; corrosive; incompatible with strong oxidizing agents and mineral acids	Flotation promoter	116,000
MIBC	108-11-2	Class II combustible liquid	Moly. frother	116,000
Ammonium sulfide	12135-76-1	Poisonous, corrosive, flammable liquid; incompatible with numerous chemicals	Flotation reagent	1,400,000
Unnamed flocculent (similar to SUPERFLOC polyacrylamide or acrylamide-acrylic)		Organic polymer flocculent	Thickener	17,400
AERODRI 100 (ethanol, sodium dioctyl sulfosuccinate, 2-ethylhenanol)	000064-17-5 000577-11-7 000104-76-7	Flammable liquid; incompatible with strong acids, alkalines, and strong oxidizing agents	Filter aid/ dewatering aid	92,800
Sodium hydrosulfide	16721-80-5	Highly corrosive; incompatible with chemicals listed for ammonium sulfide	Flotation reagent depressant cation exchange	1,400,000
Fuel oil (Diesel) Dryer fuel (Diesel)	8008-20-6	Flammable liquid	Moly. collection/ truck operation	150,000
Sulfuric acid	7664-93-9	Strong acid	Lab use	<100

Notes: Either ammonium sulfide or sodium hydrosulfide would be used as a flotation reagent.

Chemicals include acids, alcohols, carbonates, esters, halogenated organics, ketones, organic sulfides, aldehydes, amides, combustibles, flammables, hydrazine isocyanates, organic peroxides, phenols, nitrites, organic nitro compounds, organophosphates, explosives, polymerizable compounds, epoxides, and oxidizing agents.

Diesel fuel would be used as a molybdenum collector in the mineral processing operation. The fuel would be stored in a 2,000-gallon holding tank approximately 8 feet in diameter by 6 feet tall. The fuel storage tank would be installed in conformance with applicable NMED Petroleum Storage Tank Bureau regulations for New Storage Tank Systems in 20.5.4 NMAC.

Diesel fuel for mobile equipment would be stored in tanks at another location on-site. The tanks would be installed in conformance with applicable NMED Petroleum Storage Tank Bureau regulations for New Storage Tank Systems in 20.5.4 NMAC. The expected volume of diesel for the site is less than 500,000 gallons, to be contained in two 248,690 gallon aboveground storage tanks (ASTs), 24 feet high, with a diameter of 42 feet. As required, secondary containment would be constructed with a capacity of at least 110 percent of the size of the largest AST in the containment area plus the volume displaced by the other AST(s). If used for containment, a geo-synthetic membrane would have a minimum thickness of 60 mils and would be covered with fine material to limit damage due to abrasion or puncturing.

NMCC plans to store less than 2,000 gallons of antiscalants in appropriate ASTs that meet industry standards. The antiscalants proposed would likely be NALC09731 or NALC09735 (or equivalent). Other reagents would be maintained in the reagent building, a structure made with 8-inch concrete block walls and a metal roof, 3,000 square feet in size, slab on grade construction, with a 6-inch concrete floor. On-site reagent storage is expected to be similar to the storage and processing employed by Quintana in 1982, as follows:

- Lime storage: A 200-ton-capacity silo would funnel lime into a lime feed pump tank and from there into two holding tanks.
- Xanthate (K. Amyl) (or equivalent): Flotation reagent Xanthate would be kept in drums and transferred to a mixing tank, then to a holding tank, and finally to the head tank.
- AEROFLOAT 238 (or equivalent): Used in flotation promoting, would be received in 50-gallon drums and have a plant storage capacity of 2,800 gallons. Aerofloat would be kept in drums and transferred to a mixing tank, then to a holding tank, and finally to a head tank.
- MIBC (or equivalent): MIBC would be transferred from trucks to a holding tank and, as needed, to a head tank.
- AERODRI 100: Used as a filter and dewatering aid, would arrive on-site in 500-pound drums. The reagent would be fed directly from the drums into the milling process.
- Sulfuric acid: Use of small amounts (<100 pounds) of sulfuric acid would be limited to the laboratory.

All reagent storage tanks and mixing areas would be located inside secondary containment to protect soils and groundwater. A collection sump and pump system would be provided at each containment to return spilled material back to a storage tank or into the milling process as necessary. Material Safety Data Sheets for the reagents to be used would be readily available in accordance with MSHA's *Hazard Communication for the Mining Industry* (30 CFR Part 47).

Hazardous Materials Management: In 49 CFR 172.101 the Hazardous Materials Table designates the materials listed as “hazardous materials for the purpose of transportation of those materials”. Hazardous substances are designated as such in 40 CFR 302.4 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) Title III. Hazardous materials would be transported to the Copper Flat mine by DOT-regulated transporters and stored on-site in DOT-approved containers. Spill containment structures would be provided for storage containers. Hazardous materials would be managed in accordance with regulations identified in 40 CFR 262 Standards Applicable to Generators of Hazardous Waste.

Hazardous materials and substances that may be transported, stored, and used at the Copper Flat mine in quantities less than the threshold planning quantity designated by SARA Title III for emergency planning would include blasting components, petroleum products, and small quantities of solvents for laboratory use. Small quantities of hazardous materials not included in the above list may also be managed at the Copper Flat project; such materials are contained in commercially produced paints, office products, and automotive maintenance products.

Blasting components, including ammonium nitrate and diesel fuel, would be stored on-site in bins and tanks. NMCC currently anticipates utilizing two explosives magazines (one for boosters and one for blasting caps), each no larger than 8 feet by 8 feet, with 1,000-pound capacities. In addition, NMCC would utilize one 75-ton capacity silo for storage of ammonium nitrate. All explosive materials would be stored away from the plant site in compliance with MSHA, New Mexico SMIO's regulations, and U.S. Department of Homeland Security requirements. Management of hazardous materials at the Copper Flat project would comply with all applicable Federal, State, and local requirements, including the inventory and reporting requirements of Title III of CERCLA, also known as the Emergency Planning and Community Right to Know Act. All petroleum products, kerosene, and reagents used in the mill would be stored in aboveground tanks within a secondary containment area capable of holding 110 percent of the volume of the largest vessel in the area.

The spill contingency plan (SCP) would be reviewed and updated at a minimum of every 3 years and whenever major changes are made in the management of these materials. Inspection and maintenance schedules and procedures for the tanks, as well as all piping connecting the facility with the tailings pond, would be set forth in the sections of the SCP that address hazardous materials and petroleum products. Fuel and oil for diesel- and gas-powered equipment would be stored in aboveground, sealed tanks located near the processing facilities area. The tanks would have secondary containment capable of holding 110 percent of the volume of the largest vessel. Designated fuel dispensing areas would be lined pads consisting of gravel underlain by a plastic liner. Surface piping would lead from each tank to the fuel dispensing area. The refueling hoses would be equipped with overflow prevention devices and emergency shutoff valves. Storage of refueling hoses would be within secondary containment. Other refueling would occur in the field utilizing fuel/lube service trucks with either secondary containment built into the truck or the vehicle would be parked within an area having secondary containment when not in use.

Hazardous wastes, other than those from the laboratory, would also be managed in the short-term storage facility prior to their shipment to an off-site licensed disposal facility. These materials may include waste paints and thinners. Spent solvents and used oils would be returned to recycling facilities. Waste oil and lubricants would be collected and hauled off-site by a buyer/contractor for recycling. Solvents would be collected by a subcontractor and recycled off-site.

An ongoing inventory of all materials used at the mine area and mill would be provided on a monthly basis to the appropriate Federal, State, and local regulatory agencies. The local fire department would be kept informed about materials stored on-site and appropriate emergency response.

Spill Contingency Plan: NMCC has developed a preliminary SCP to prevent and limit the impacts of a reagent or fuel spill. This plan describes the reporting and response that would take place in the event of a spill, release, or other upset condition, as well as procedures for cleanup and disposal. The plan would be posted and distributed to key site personnel and would be used as a guide in the training of employees. Also, the plan would address mitigation of potential spills associated with project facilities as well as activities of on-site contractors. The use, transportation, and storage of reagents and fuels would be covered in the plan. The emergency reporting procedures would be posted in key locations throughout the mine area. Containment structures designed to prevent the migration of a spill are included in the design of the facilities.

NMCC would be responsible for spill events at the mine area, while contract haulers (i.e., trucking companies) would be responsible for accidents and spills along the transportation routes. Fuel and oil for the diesel- and gasoline-powered equipment would be stored in aboveground, sealed tanks near the processing facilities area. The tanks would have secondary containment capable of holding 110 percent of the volume of the largest vessel.

Reporting spills or releases of certain materials to the environment may be divided into four categories:

- Those requiring internal notification only;
- Those also requiring notification to the State of New Mexico;
- Those also requiring notification to the National Response Center and the local emergency planning committee pursuant to CERCLA or Superfund; and
- Those subject to Clean Water Act requirements only.

Determining which of the above categories is appropriate for any particular spill or release depends on the material spilled or released, the amount spilled or released, and the circumstances of the spill or release.

Monitoring: Baseline monitoring of current environmental conditions was conducted in 2010, 2011, 2012, and 2013 in accordance with the Sampling and Analysis Plan for Copper Flat mine. This plan, known as the Copper Flat Monitoring Plan, was developed to collect local and regional baseline information and provides the basis for the monitoring of regional impacts that may result from the operation of the mine. This plan would be updated as detailed engineering for the proposed mine facilities is completed, and the monitoring requirements become more defined.

Technical Updates: During the course of operations, NMCC would periodically review and update the geochemical and hydrogeological predictions, mine waste characterization studies, and pit lake studies to incorporate new information accumulated during operations. NMCC would review the data every 5 years and make updates as necessary. These updates would provide quantitative predictions of water quality during the operational and post-closure period. Mitigation would be developed as necessary.

Sustainability: NMCC recognizes the social and economic impacts from "boom and bust cycles" that sometimes occur in connection with the mining industry. In addition, removal of facilities that may have post-mining uses is not in accordance with the overall environmental practice of conservation. NMCC would work with the local and regional communities to identify post-mining uses of the land and facilities to enhance opportunities to sustain the economy and culture in the post-mining phase of this project.

Environmental Baseline: For the purpose of establishing baseline conditions for environmental resources at the Copper Flat mine area prior to beginning mining operations, NMCC has gathered resource data and conducted surveys for potentially disturbed land within the mine area for the project. These baseline conditions are documented in baseline data reports used in this EIS as a tool to identify and evaluate changes from baseline environmental conditions.

Land has also been identified that would be disturbed outside the mine area. There are nine millsite claims that were previously established by Quintana. The 5-acre millsite claims would be used for staging, equipment, well pads, water tanks, pumping systems, truck access, and structures to maintain the water supply pumping stations.

The disturbed land outside the mine area was independently surveyed to establish an environmental baseline that is also used in this EIS as a tool to identify and evaluate changes from baseline environmental conditions.

2.2 ALTERNATIVE 1: ACCELERATED OPERATIONS – 25,000 TONS PER DAY

In 2011 and 2012, NMCC followed the standard industry practice of performing a preliminary feasibility study to further develop internal engineering plans for the Copper Flat mine. In addition, an expanded resource exploration program was launched at Copper Flat to better define the ore body. The result of these two efforts was a NMCC-revised plan of development for Copper Flat based on new, more detailed information about the ore body and the engineering studies. NMCC's preliminary feasibility study for Copper Flat maintained the same locations indicated in the Proposed Action for the proposed mine pit, processing area, and TSF, but refined the process to reflect better engineering data, increase the mine efficiency, and improve project economics.

Overall, this alternative (Alternative 1 or the Accelerated Operations Alternative) to the Proposed Action would have the same general scale and scope of operation, with differences largely attributable to higher process rates to improve project viability, and some increases in efficiency wherever possible. Table 2-15 describes the differences between the Proposed Action and this alternative.

This section would highlight only those activities and conditions that would change as a result of accelerating the operations. The source for this section is NMCC 2012c - Mine Operation and Reclamation Plan, NMCC, dated July 18, 2012. Additional information has been collected which updates the mine operation and reclamation plan (MORP). That information is included and is referenced separately.

The project would directly impact 1,401 acres as shown in Table 2-16. Of this, 644 acres would be public land and 758 acres would be private land. Disturbance at ancillary facilities would be the same as the Proposed Action.

Table 2-15. Summary of Differences Between Proposed Action and Alternative 1

Table 2-15. Summary of Differences Between Proposed Action and Alternative 1	
No Change from Proposed Action	**Changes From Proposed Action**
• General scale and scope of the operation • Total ore tons processed • Mining process o Open pit o Drill, blast, loader, truck o Type of equipment used • Mineral beneficiation process o Crush, grind, sulfide flotation, concentrate filtering o Type of equipment used • Tailings storage o Conventional slurry o Raised TSF o Centerline construction with tailings sand o Fully lined o Monitoring systems • Type of mine & process equipment used • Three final products o Copper concentrate with gold & silver o Molybdenum concentrate o A small amount of coarse gold concentrate • Concentrate handling, shipping methods, shipping route, destination • Operating schedule (24 x 7) • Size of the mine area • Location and siting of the proposed facilities • Reuse of existing infrastructure and site grading • Reuse of existing diversion structures • Ongoing exploration • Concurrent reclamation practices • Reclamation standards and methods (with updates to new regulations) • Planned water conservation activities standard aspect of operating plan • Water source, storage, and delivery/distribution systems • Surface and groundwater protection methods • Standards for groundwater monitoring around facilities • Power source, transmission, and distribution systems • Growth media borrow and storage plans • Fencing and exclusionary devices • General viewshed • Construction workforce required • Mine workforce required • Construction and mine workforce skill requirements • No heap leach • No on-site smelting/refining • No placer mining	• Process rate increased to nominal 25,000 tpd to improve project economics • Mine life shortened to 11 years due to higher process rate • Whole tailings thickener removed from tailings flowsheet in order to improve TSF stability • Non process water use decreases due to more efficient designs • Annual water use increases due to higher process rate • Duration of water use decreases due to higher process rate • Total water use over life of mine increases slightly due to higher process rate • Total disturbance footprint reduced due to more efficient design • Number and disturbance footprint of rock storage piles reduced due to more efficient design • Power requirements increase due to increased process rate • Concentrate loads trucked on NM-152 and US I-25 increase due to higher process rate

Table 2-16. Summary of Proposed Disturbance Within the Mine Area – Alternative 1

Disturbance	Total (Acres)
TSF	619
Open pit	156
WRDFs	237
Low-grade ore stockpile	41
Haul roads	25
Plant site area	129
Growth media stockpiles	112
Diversion structures	44
Exploration	40
Total Disturbance	**1,401***
Public land	644
Private land	758

Source: NMCC 2014a.

* Totals are rounded for simplicity.

The Accelerated Operations Alternative proposes to increase material processing at the mine from 17,500 tpd to 25,000 tpd. Annually, the mining operation would process an estimated 9.1 million tons of copper ore mill feed. The operations include the phases and activities summarized below. In general these phases are sequential, but there would be some overlap as the activities of an earlier phase continue during the implementation of subsequent phases.

- Pre-construction (permitting) - 2 years;
- Construction (site preparation) - 1.5 years;
- Operations (mineral beneficiation) - 11 years;
- Closure/reclamation - 3 years; and
- Post-closure monitoring, care, and maintenance - 12 years.

As with the Proposed Action, the plant facilities would be constructed at the site of the original Quintana plant site, and, to the extent practicable, would use most of the original concrete foundations. The plant site, which would include the crusher, concentrator, assay lab, mine shop, warehouse, security, and administration buildings, would occupy approximately 129 acres, and would be located between the open pit and the TSF area. Scheduled operations and saleable products would be the same as with the Proposed Action.

2.2.1 Mine Operation - Open Pit

As with the Proposed Action, the mining of new ore would entail the expansion of the existing open pit and the Copper Flat ore body would be mined by a multiple bench, open pit method. Over the life of the project, this alternative would produce approximately 100 million tons of copper ore, 60 million tons of waste rock, and 3 million tons of low-grade copper ore (less than 0.20 percent copper). The existing pit would eventually be enlarged to a diameter of approximately 2,800 feet with an ultimate depth of approximately 900 feet. The area of the pit would be expanded to 156 acres. The existing diversion of Greyback Arroyo, located south of the pit, would not be altered by the proposed pit expansion. The processing of the ore would be the same as with the Proposed Action.

As under the Proposed Action, mine equipment types would consist of standard off-the-shelf units. Table 2-17 summarizes the major mine equipment units that would be present on-site throughout the life of the mine.

Table 2-17. Major Mine Equipment Fleet on Hand

Table 2-17. Major Mine Equipment Fleet on Hand												
Equipment	Year of Operation											
	-1	1	2	3	4	5	6	7	8	9	10	11
Blast hold drill, 45,000 lb.	1	3	3	3	3	3	3	3	3	3	3	3
Hydraulic shovel, 19.6 cubic yard	-	1	1	1	1	1	1	1	1	1	1	1
Loader, 17 cubic yard	1	1	1	1	1	1	1	1	1	1	1	1
Haul truck, 100 tons	4	8	9	9	9	10	10	10	10	10	10	10
Track dozer, 410 HP (D9T)	3	3	3	3	3	3	3	3	3	3	3	3
Wheel dozer, 354 HP (824H)	1	1	1	1	1	1	1	1	1	1	1	1
Motor grader, 16’ (16M)	2	2	2	2	2	2	2	2	2	2	2	2
Water truck, 10,000 gal.	2	2	2	2	2	2	2	2	2	2	2	2
Pioneer drill	1	1	1	1	1	1	1	1	1	1	1	1
Backhoe, 2 cubic yard	1	1	1	1	1	1	1	1	1	1	1	1
Total	**16**	**23**	**24**	**24**	**24**	**25**	**25**	**25**	**25**	**25**	**25**	**25**

Note: Units owned based on fleet buildup and replacement.

The amount of equipment proposed for use under this alternative is larger than that for the Proposed Action because of the accelerated mining process. In addition, a 19.6-cubic-yard hydraulic shovel and a 17-cubic-yard front-end loader is proposed under this alternative to match production requirements based on the financial analysis of the mine schedule (NMCC 2012b). The number of blast hole drills would be increased under this alternative due to the increased rate of ore processing.

2.2.2 Ore Processing

Ore processing would be the same as for the Proposed Action with one exception: the processing rate would be 25,000 tpd. A depiction of the proposed mining process is provided in Figure 2-7.

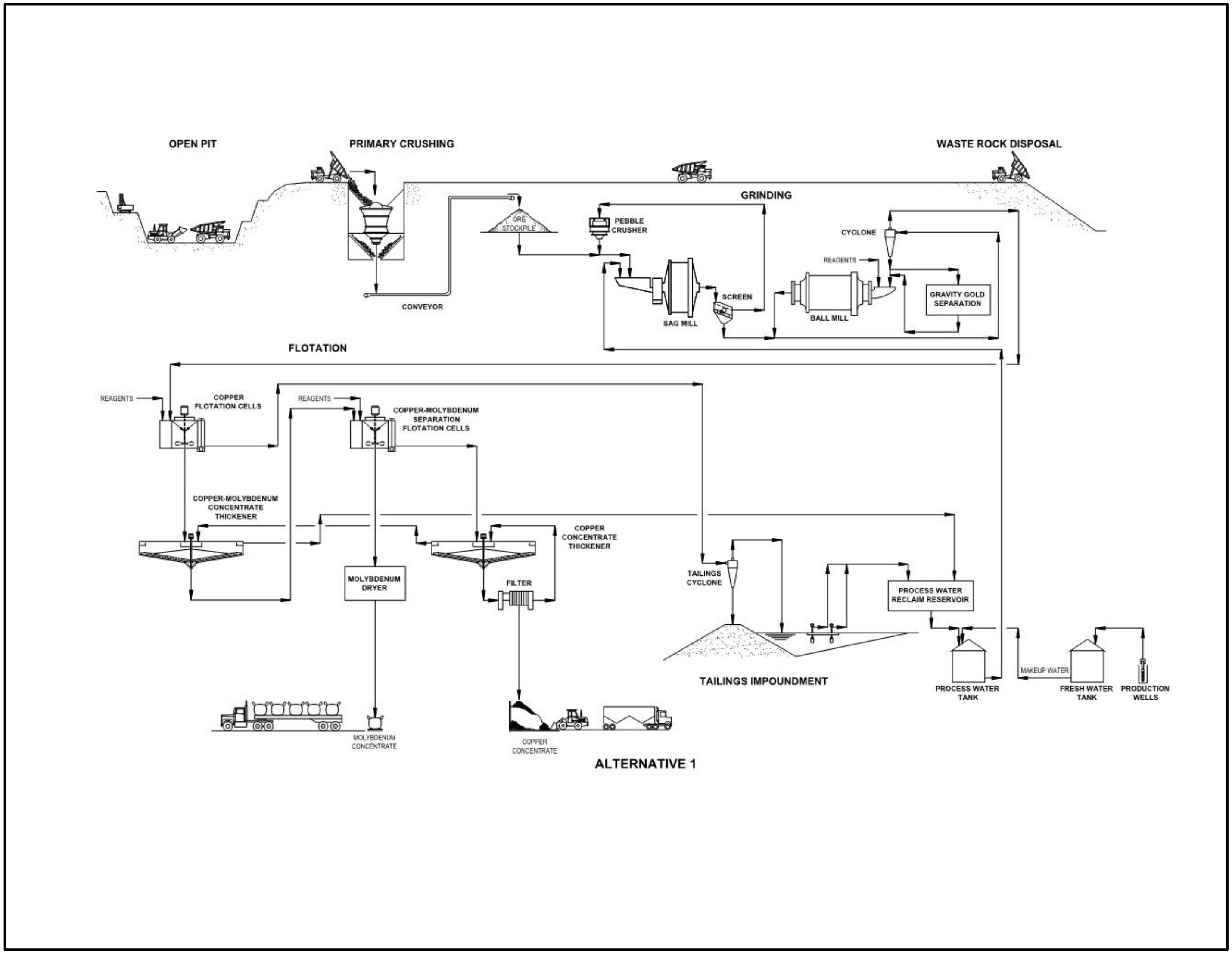
2.2.3 Mine Facilities

The primary mine facilities would be the same as the Proposed Action with the exception of the elimination of those facilities associated with tailings thickener (tailings cyclone thickener and tailings glandseal water tank) (NMCC 2014a). These facilities would not be required because the use of a gravity discharge disposal method would be implemented. The proposed mine and facility layouts are depicted in Figures 2-8 and 2-9.

Equipment in the concentrator building is expected to consist of the following (NMCC 2014a):

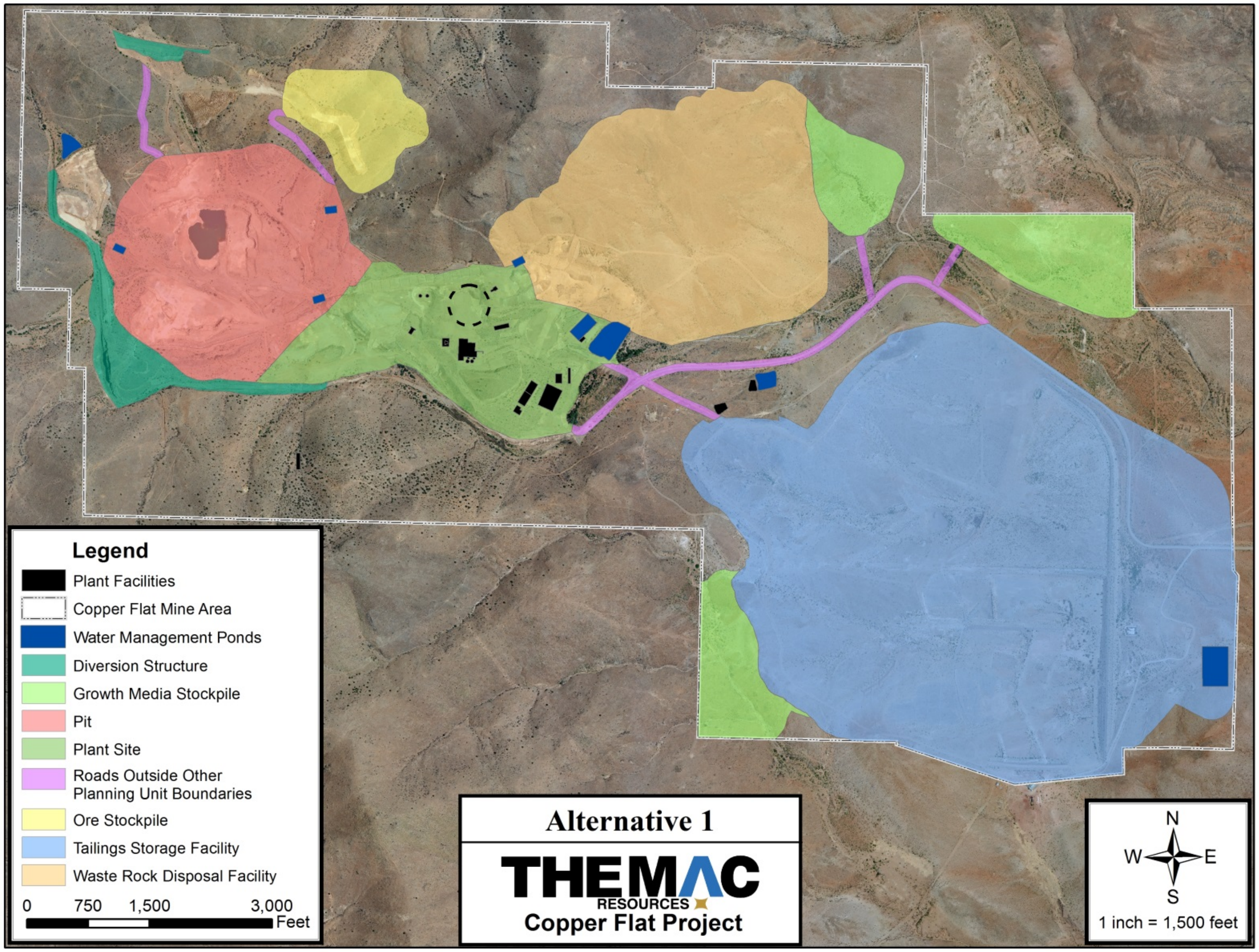
- Primary crushing - Same as with the Proposed Action.
- Grinding - Same as with the Proposed Action except instead of an 18-foot by 24-foot ball mill there would be one 24-foot-diameter by 35-foot-long ball mill, 12,700 horsepower.
- Flotation - Same as with the Proposed Action.
- Concentrate - Same as with the Proposed Action.

Figure 2-7. Mining Process – Alternative 1



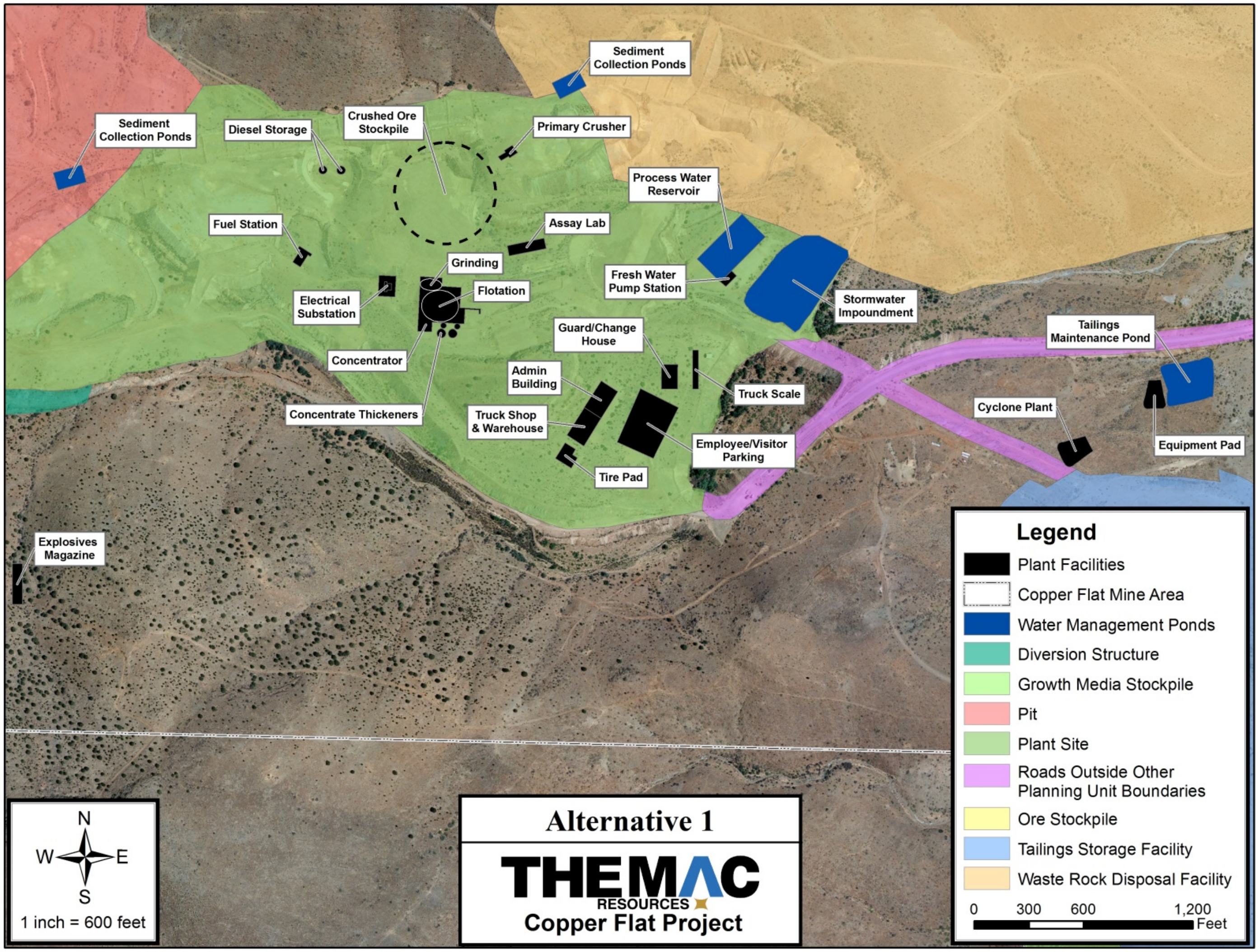
Source: NMCC 2012b.

Figure 2-8. Mine Layout – Alternative 1



Source: NMCC 2015.

Figure 2-9. Mine Facilities – Alternative 1



Source: NMCC 2012c.

2.2.3.1 Tailings Storage Facility

The existing TSF at Copper Flat was constructed by Quintana Minerals to serve their 1982 mining operation. The storage facility received 1.2 million tons of material and was essentially reclaimed in 1986. The TSF remains in place and is located southeast of the former plant site. NMCC proposes to construct a new lined TSF over the area used by previous operations for tailings storage. Tailings would be transported from the mill via slurry pipeline and deposited in the new TSF. Ancillary facilities associated with the TSF would include a tailings slurry delivery system, a tailings solution reclaim and recycling system (barge pump system) and an underdrain seepage return system.

Approximately 100 million tons of tailings are expected to be stored over the life of the project for this alternative. Tailings deposition would be approximately 25,000 tpd. During progressive settlement, water would be pumped from the TSF and returned to the process circuit. The total expected water recovery by reclaim systems would be a nominal 70 percent.

The size and location of the storage facility pool would vary during the life of the project. The size of the pool would be affected by pre-deposition grading in the storage facility, the amount of tailings deposited, precipitation, evaporation rates, seepage rates into the designed embankment seepage collection system, infiltration into underlying soils and water recycling rates. The location of the pool would migrate within the storage facility as tailings beaches form. Tailings deposition would be managed to force the pool away from the embankment toward the upstream reaches of the storage facility. The TSF would be fenced to restrict access.

TSF Design: The TSF would be designed and would be constructed and maintained to prevent adverse impacts to the hydrologic balance and adjoining property and to assure the safety of the public. Water reporting to the TSF would be recovered from the pool of water that would form in the storage facility and be returned to the mill process water system for reuse. Precipitation would also contribute to the volume of water in the storage facility. The height of the embankment would be designed so that the storage facility completely contains both the normal operating volume of water and the amount of stormwater runoff from 100 percent of the PMP. The U.S. Department of Commerce (1988) estimates the 72-hour PMP depth is approximately 26 inches in the vicinity of the mine area. The TSF was designed in accordance with the design and dam safety guidelines and regulations of the OSE Dam Safety Bureau

TSF Process: The use of a high rate thickener as utilized in the Proposed Action constrains operations for an increased rate of ore processing. This constraint would only be alleviated by significantly increasing the footprint of the TSF. Instead, this alternative proposes to use a gravity discharge disposal method for tailings slurry that is not thickened.

The tailings from the proposed re-opening of the mine would be contained in a new TSF, which would be constructed at the same location as the previous Quintana operation at the site. The new TSF would be expanded approximately 1,000 feet to the east of the existing unlined TSF. The TSF would be constructed with a synthetic HDPE liner and drainage system to limit the opportunity for seepage to impact the groundwater, as required by NMED.

Tailings from a sump located at the concentrator would be transported by gravity flow to a cyclone plant with pump station at the periphery of the TSF. Following cyclone separation of the sand fraction, cyclone underflow and overflow would be delivered to the TSF in separate piping systems.

Delivery of the underflow sand would require pumping through the life of the facility. Delivery of the cyclone overflow would be by gravity until the later stages of the operation. Following cyclone classification, the underflow (sands) and overflow (fine-grained tailings) would be routed to a pumping station with separate pump streams for the underflow and the overflow tailings. The underflow sand would be discharged on the dam crest and downstream dam slope, and used for dam construction in a centerline construction scheme. Cyclone overflow would be routed to the interior of the TSF. Sand line spigots would be used to deposit the cyclone underflow in paddocks (bermed areas) or on the downstream slope of the sand dam.

Primary considerations for effective dam construction practices include adequate drainage and compaction of the underflow sand. Industry experience indicates that compaction to a relative density of 60 percent (equivalent to approximately 90 percent of ASTM D698 maximum dry density) would result in low potential for liquefaction under static and seismic loading conditions. Meeting compaction requirements would require that the underflow sand be placed or spread in thin lifts and exposed to evaporation and drainage prior to compaction. Process water would be reclaimed from reclaim pumps on barges located in the supernatant pond in the TSF and in a seepage collection pond. Reclaim water would be returned to the process water storage reservoir in the process facilities area. Reclaim pump capacity on both barges would be approximately 11,000 gpm, which is generally equivalent to the maximum rate at which process water is delivered to the cyclone plant and tailings distribution system in whole tailings slurry. All process water make-up requirements can be met by pumping from either reclaim location. In the event of a significant storm event where excess stormwater is in storage, delivery of water from external sources can be suspended and stormwater can be returned to the process facilities and consumed as bound water in the tailings.

Entrainment represents the most significant water loss and is estimated on the basis of the final, post-deposition dry density for cyclone underflow, cyclone overflow, and whole tailings, and the relative production rates for each material.

The estimated process water recovery rate averaged 8,552 gpm. Given the average whole tailings slurry water content of 10,801 gpm, the average make-up water requirement for 25,000 tpd ore processed is estimated to be 2,249 gpm or approximately 119 gallons per ton of ore processed assuming a 92 percent plant utilization rate.

TSF Monitoring: TSF monitoring would be the same as for the Proposed Action.

2.2.3.2 Ancillary Facilities

The ancillary facilities would be the same as for the Proposed Action.

2.2.3.3 Sanitary Wastewater Treatment

The sanitary wastewater treatment facilities would be similar to the Proposed Action. Sewage waste would be disposed of through a septic tank and leach field system permitted by NMED. The waste system would be connected to project buildings. Sierra County would require a septic system permit designed by a qualified New Mexico licensed professional engineer. The exact location of the septic system has not been identified. Appropriate percolation tests would be conducted to prepare the necessary septic system designs for the project. Sanitary waste during the construction phase of the project would be collected in a system of portable chemical toilets. These would be periodically cleaned and emptied by a licensed contractor and the waste transported off-site for disposal.

2.2.4 Waste Rock Disposal Facility

As with the Proposed Action, the WRDF would be located adjacent to the open pit in an area used for waste rock disposal by the previous operator on the east side of Animas Peak. This disposal area would be expanded to cover approximately 237 acres and at the end of the mine life, the height of the disposal area would be at 5,775 feet above sea level. Total material contained in the WRDF at the end of the expected life of the project would be approximately 60 million tons. The low-grade stockpile would cover an area of approximately 41 acres and include about 3 million tons of rock assaying less than 0.20 percent copper. As with the Proposed Action, the WRDF would be regraded and reclaimed to blend into the surrounding topography to the extent practicable.

2.2.5 Project Workforce and Schedule

The estimated operational life required to recover the proven minerals (copper, molybdenum, gold, and silver) is 11 years. Labor requirements for the mine are displayed in Table 2-18.

Table 2-18. Mine Personnel Requirements – Year One – Alternative 1

Table 2-18. Mine Personnel Requirements – Year 1 – Alternative 1	
Work Type	**Number of Employees**
Mine salary	10
Mine operators	52
Mobile maintenance	26
Mine tech services	4
Process salary	8
Process operators	30
Process maintenance, electricians, etc.	17
Process tech services	6
Administration	17
Total Mine Workforce	**170**

Source: NMCC 2014a.

2.2.6 Electrical Power

The electrical power supply would be the same as the Proposed Action.

For most aspects of the operation, unit power demand (kilowatt hours per ton) is constant among all plans. This is the result of unit operations and material processed being the same between all plans. The difference between the three plans is seen when power demand is presented as total power used in a given time period (hour, day, or year). Power used is a function of the processing rate and therefore the power need for a specific period increases as more tons are processed in that same period. Because of the increased processing rate, the electrical demand would increase and the plant electrical load requirement for 25,000 tpd processing rate (9.1 million tpy) is tabulated in Table 2-19.

Table 2-19. Summary of Project Electrical Demand – Alternative 1

Table 2-19. Summary of Project Electrical Demand – Alternative 1		
Activity	**Power Demand (kWh/ton)**	**Power Demand (GWh/Year)**
Crushing	0.38	3.46
Grinding	15.71	142.96
Flotation	2.50	22.75
Molybdenum plant	0.14	1.27
Concentrate filtering	0.16	1.46
Tailings system	0.50	4.55
Reagent system	0.24	2.18
Water system	2.69	24.48
Ancillaries	0.05	0.46
Total	**22.37**	**203.57**

Source: NMCC 2014a.

As with the Proposed Action, an emergency generator would be installed on-site for backup power in the event of power loss to maintain critical systems and to aid in a controlled shut down. On-site power distribution would include one 25-kV distribution line. Because the configuration and size of these distribution lines, standard raptor proof protective designs would be incorporated into the line design and line upgrade, as presented in the Rural Electrification Administration guidelines. This design would be used for the entire length of the distribution line within the mine area.

2.2.7 Water Supply

The water supply descriptions and defining classifications for Alternative 1 are the same as the Proposed Action. Differences between Alternative 1 and the Proposed Action are seen in quantities of water use and supply.

2.2.7.1 Water Use

Total water use for the Copper Flat mine, including all recycled water, would be approximately 18,674 AF on a yearly average basis. Total water use is presented in Table 2-20.

Table 2-20. Total Water Use* – Alternative 1

Table 2-20. Total Water Use* - Alternative 1		
	Alt 1	**Proposed Action**
Average annual water use (AF)	18,674	13,370
Average water used to process 1 ton of material (gallons)	632	633
Total water use – life of mine (AF)	211,000	209,000

Note: * Includes recycled water

Ninety-five percent of the water used would be used for processing copper ore. The other 5 percent of water use would be for dust control, maintenance, laboratory, and domestic use. Average annual water use by process is presented in Table 2-21.

Table 2-21. Water Use by Process* – Alternative 1

Table 2-21. Water Use by Process* – Alternative 1				
Water Use	Acre-Feet per Year			Percent of Total
	Recycled	Non-recycled	Total	
Ore Processing:				
Reclaimable TSF water	12,845	0	12,845	69%
Water retained in tailings	0	4,144	4,144	22%
Evaporation	0	703	703	4%
Concentrates	0	13	13	<1%
Subtotal	**12,845**	**4,860**	**17,705**	**95%**
Dust control	0	726	726	4%
Other	0	242	242	1%
Total Use	**12,845**	**5,828**	**18,674**	**100%**

Notes: * Includes recycled water use.
Columns may not sum exactly due to rounding.

2.2.7.2 Water Sources

Table 2-22 and Figure 2-10 summarize the sources of water that would be used at Copper Flat for Alternative 1.

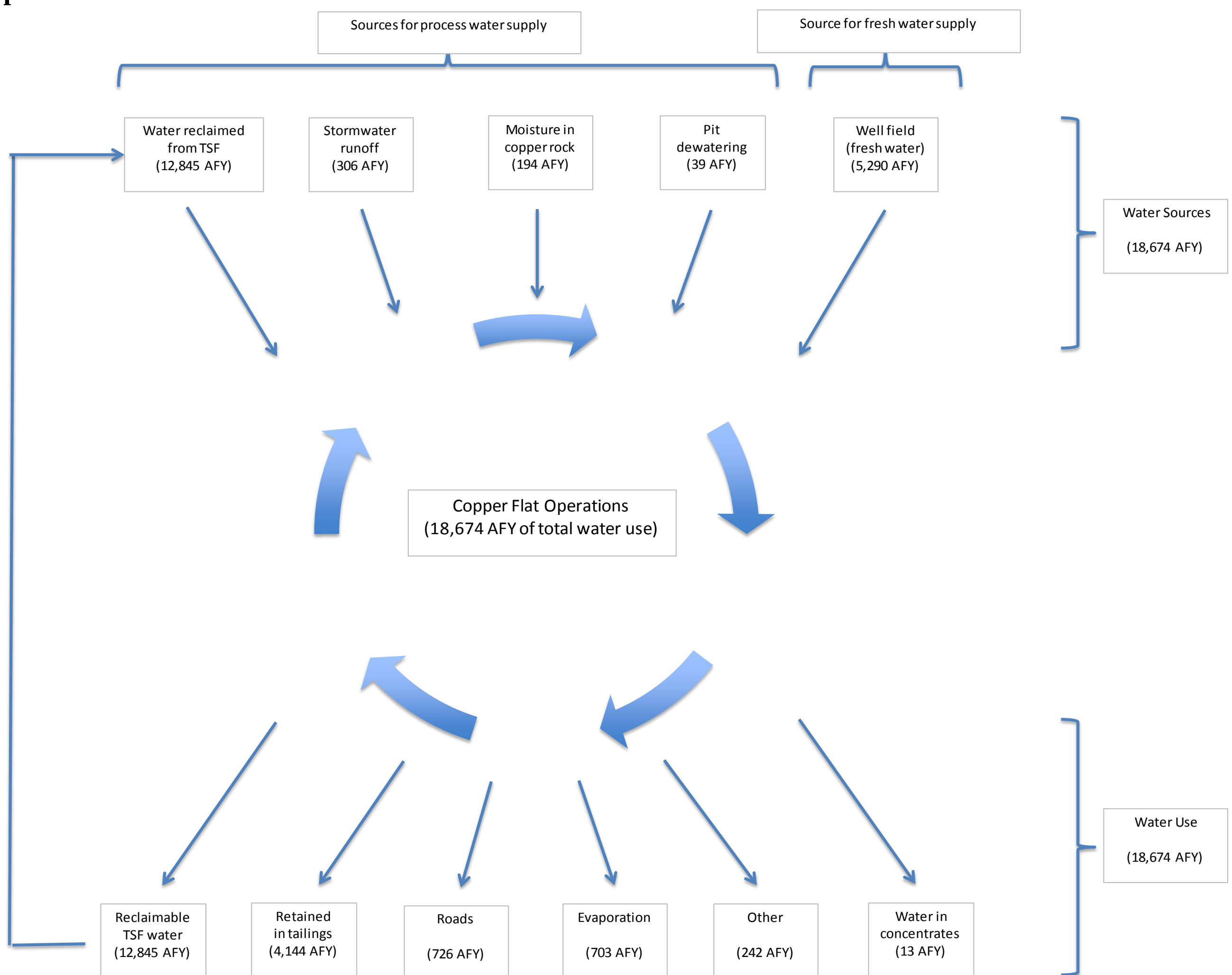
Table 2-22. Water Sources* – Alternative 1

Table 2-22. Water Sources* – Alternative 1				
Water Source	Acre-Feet per Year			Percent of Total
	Recycled	Non-recycled	Total	
Process Water:				
Water reclaimed from TSF	12,845	0	12,845	69%
Stormwater	306	0	306	2%
Moisture in the ore	194	0	194	1%
Pit dewatering	39	0	39	>1%
Subtotal	**13,384**	**0**	**13,384**	**72%**
Fresh water (groundwater wells)	0	5,290	5,290	28%
Total Use	**13,384**	**5,290**	**18,674**	**100%**

Note: * Includes water from recycled water sources.
Columns may not sum exactly due to rounding.

Process Water Sources: The source, description, and operation of the process water sources would be the same as described in the Proposed Action. Process water sources would provide 13,384 AF per year of water used by this alternative, 72 percent of the total need. Stormwater management and use would be the same as described in the Proposed Action. Pit water management and use would be the same as described in the Proposed Action.

Figure 2-10. Copper Flat Water Sources and Water Use – Alternative 1



Source: THEMAC 2015.

Fresh Water Source: The source and operation for fresh water supply and delivery to the mine would be the same as described in the Proposed Action. The description of the four production wells and delivery system is the same as described in the Proposed Action. Fresh water would provide for 5,290 AF per year (28 percent) of the total water used for this alternative.

2.2.7.3 Water Conservation

Water conservation activities would be the same as described in the Proposed Action.

2.2.7.4 Water Recycling

Water recycling activities would be the same as described in the Proposed Action.

2.2.7.5 Decreasing Water Demand

Activities to decrease water demand would be the same as described in the Proposed Action.

2.2.8 Growth Media

Growth media would be addressed in the same manner as the Proposed Action.

2.2.9 Borrow Areas

Borrow areas with this alternative would be addressed the same as with the Proposed Action.

2.2.10 Inter-Facility Disturbance

Inter-facility disturbance with this alternative would be the same as with the Proposed Action.

2.2.11 Fencing and Exclusionary Devices

Fencing and exclusionary devices employed with this alternative would be the same as with the Proposed Action.

2.2.12 Haul Roads and On-Site Service Roads

Haul roads and on-site service roads with this alternative would be the same as with the Proposed Action.

2.2.13 Transportation

Transportation measures employed with this alternative would be the same as with the Proposed Action. Exceptions would be for increased levels of activities for concentrate shipments because of the increase processing rate.

- Copper concentrate shipment schedule (hauling weekdays only) would be:
  - Years 1–5: ship 12 to 16 truckloads per day, 5 days per week;
  - Years 6 +: ship 8 to 12 truckloads per day, 5 days per week.

- Molybdenum concentrate shipment schedule (hauling weekdays only) would be:
  - Life of mine: ship three truckloads per month (NMCC 2014a).

2.2.14 Exploration Activities

The exploration activities with this alternative would be the same as with the Proposed Action.

2.2.15 Reclamation and Closure

The reclamation and closure measures employed with this alternative would be the same as with the Proposed Action. Solutio flow from underdrainage during ore processing would be 1,600 gpm under this alternative. The draindown rate at 6 months following process shutdown would be 1,100 gpm.

2.2.16 Environmental Protection Measures

The environmental protection measures employed with this alternative would be the same as with the Proposed Action with two exceptions:

- In reagent management there would not be any use of AERODRI 100 (ethanol, sodium dioctyl sulfosuccinate, 2-ethylhenanol).

2.3 ALTERNATIVE 2: ACCELERATED OPERATIONS – 30,000 TONS PER DAY

In 2013, NMCC followed the standard industry practice of conducting a definitive feasibility study, which follows and refines the preliminary feasibility study, to further fine-tune the internal plan of development for the Copper Flat mine. This study applied a more detailed approach to evaluating the mine processing circuit and overall initiative. The definitive feasibility study found that the mine would be more efficient with an increase to the TSF capacity and an increase to the annual ore processing rate. Alternative 2, as defined in this EIS, is based on the definitive feasibility study for Copper Flat and has a TSF that fits in the same footprint as the Proposed Action but has a larger volume for storage. Alternative 2, as defined in the EIS, has a 30,000 tpd plan with a 12-year mine life, but remains within the mine area evaluated under the Proposed Action.

40 CFR 1500-1508 specifies the requirements for an EIS. In these regulations, it is stated:

> *"**§1502.14 Alternatives including the proposed action.** This section is the heart of the environmental impact statement. Based on the information and analysis presented in the sections on the Affected Environment (§1502.15) and the Environmental Consequences (§1502.16), it should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public. In this section agencies shall:*
>
> *(e) Identify the agency's* preferred alternative *or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference."*

In accordance with the requirements stated in these regulations, the BLM has designated Alternative 2 as the Preferred Alternative. This alternative has the same general scale and scope of the Proposed Action but proposes to process 25 million tons of ore more than the Proposed Action and Alternative 1. The other main differences are derived from an increase in the process rate to improve project economics and increases in efficiency where possible. Table 2-23 briefly describes the differences between the Proposed Action and this alternative.

Table 2-23. Summary of Differences Between Proposed Action and Alternative 2

<table>
<tr><th colspan="2">Table 2-23. Summary of Differences Between Proposed Action and Alternative 2</th></tr>
<tr><th>No Change from Proposed Action</th><th>Changes From Proposed Action</th></tr>
<tr><td>
• General scale and scope of the operation
• Mining process
  o Open pit
  o Drill, blast, loader, truck
  o Type of equipment used
• Mineral beneficiation process
  o Crush, grind, sulfide flotation, concentrate filtering
  o Type of equipment used
• Tailings storage
  o Conventional slurry
  o Raised TSF
  o Centerline construction with tails sand
  o Fully lined
  o Monitoring systems
• Type of mine & process equipment used
• Three final products
  o Copper concentrate with gold & silver
  o Molybdenum concentrate
  o A small amount of coarse gold concentrate
• Concentrate handling, shipping methods, shipping route, destination
• Operating schedule (24 x 7)
• Size of the mine area
• Location and siting of the proposed facilities
• Reuse of existing infrastructure and site grading
• Reuse of existing diversion structures
• Ongoing exploration
• Concurrent reclamation practices
• Reclamation standards and methods (with updates to new regulations)
• Planned water conservation activities standard aspect of operating plan
• Water source, storage, and delivery/distribution systems
• Surface and groundwater protection methods
• Standards for groundwater monitoring around facilities
• Power, transmission, and distribution systems
• Growth media borrow and storage plans
• Fencing and exclusionary devices
• General viewshed
• Construction workforce required
• Construction and mine workforce skill requirements
• No heap leach
• No on-site smelting/refining
• No placer mining
</td><td>
• Process rate increased to nominal 30,000 tpd to further improve project economics to meet minimum finance requirements
• Total life of mine tons processed increased 25 million tons due to exploration success
• Mine life shortened to 11 years due to higher process rate
• Whole tailings thickener removed from tailings flowsheet in order to improve TSF stability
• Non process water use decreases due to more efficient designs
• Annual water use increases due to higher process rate
• Duration of water use decreases due to higher process rate.
• Total water use over life of mine increases slightly due to higher process rate.
• Total disturbance footprint reduced due to more efficient designs
• Number and disturbance footprint of rock storage piles reduced due to more efficient design
• Power requirements increase due to increased process rate.
• Alternate power source selected
• Concentrate loads trucked on NM-152 and US I-25 increase due to higher process rate
• Lime silo increased to 300-ton capacity due to increased processing rate.
• Mine workforce increases due to increased process rate
• A package wastewater treatment plan proposed instead of septic tanks and leach field
• Reclamation & closure: At time of closure, the BLM would determine whether buried pipelines and electrical conduits would be left in place.
</td></tr>
</table>

This section highlights only those activities that would change as a result of accelerating the operations. The source for this section is NMCC 2013 - Alternative 2 – Summary Plan of Operations, NMCC, dated October 10, 2013. Additional information has been collected which updates the Summary Plan. That information is included and is referenced separately.

The project would directly impact 1,444 acres as shown in Table 2-24. Of this, 630 acres would be public land and 814 acres would be private land. Disturbance at ancillary facilities would be the same as the Proposed Action.

Table 2-24. Summary of Proposed Disturbance Within the Mine Area – Alternative 2

Table 2-24. Summary of Proposed Disturbance Within the Mine Area – Alternative 2	
Disturbance	**Total (Acres)**
TSF	633
Open pit	161
WRDFs	155
Low-grade ore stockpile	134
Haul roads	34
Plant site area	139
Growth media stockpiles	114
Diversion structures	33
Exploration	40
Total Disturbance	**1,444***
Public Land	630
Private Land	814

Source: NMCC 2014a.

*Totals are rounded for simplicity.

The Accelerated Operations Alternative proposes to increase material processing at the mine from 17,500 tpd to 30,000 tpd. Annually, the mining operation would process an estimated 10.8 million tons of copper ore mill feed. The operations include the phases and activities summarized below. In general these phases are sequential, but there would be some overlap as the activities of an earlier phase continue during the implementation of subsequent phases.

- Pre-construction (permitting) - 2 years (estimated);
- Construction (site preparation) - 1.5 years;
- Operations (mineral beneficiation) - 11 years;
- Closure/reclamation - 3 years; and
- Post-closure monitoring, care, and maintenance - 12 years.

As with the Proposed Action, the plant facilities would be constructed at the site of the original Quintana plant site, and, to the extent practicable, would use most of the original concrete foundations. The plant site, which would include the crusher, concentrator, assay lab, mine shop, warehouse, security, and administration buildings, would occupy approximately 139 acres and would be located between the open pit and the TSF area. Scheduled operations and saleable products would be the same as with the Proposed Action.

2.3.1 Mine Operation - Open Pit

As with the Proposed Action, the mining of new ore would entail the expansion of the existing open pit and the Copper Flat ore body would be mined by a multiple bench, open pit method. Over the life of the project, this alternative would produce approximately 125 million tons of copper ore, 33 million tons of waste rock, and 3 million tons of low-grade copper ore (less than 0.20 percent copper). The existing pit would eventually be enlarged to a diameter of approximately 2,800 feet with an ultimate depth of approximately 1,000 feet. The area of the pit would be expanded to 161 acres. The existing diversion of Greyback Arroyo, located south of the pit, would not be altered by the proposed pit expansion.

The processing of the ore would be the same as with the Proposed Action.

As with the 17,500 tpd that would be processed under the Proposed Action, mine equipment types would consist of standard off-the-shelf units. Table 2-25 summarizes the major mine equipment units that would be present on-site throughout the life of the mine. As with Alternative 1, the amount of equipment would be greater due to the accelerated rate of mining compared to the Proposed Action.

Table 2-25. Major Pieces of Mining Equipment

Table 2-25. Major Pieces of Mining Equipment												
Equipment	**Year of Operation**											
	-1	1	2	3	4	5	6	7	8	9	10	11
Blast hold drill, 45,000 lb.	1	3	3	3	3	3	3	3	3	3	3	3
Loader, 17 yd^3	1	2	2	2	2	2	2	2	2	2	2	2
Haul truck, 100 tons	2	8	9	10	10	10	10	10	10	10	10	10
Track dozer, 410 HP (D9T)	1	3	3	3	3	3	3	3	3	3	3	3
Wheel dozer, 354 HP (824H)	1	1	1	1	1	1	1	1	1	1	1	1
Motor grader, 14' (16M)	1	2	2	2	2	2	2	1	1	1	1	1
Water truck, 10,000 gal.	2	2	2	2	2	2	2	2	2	2	2	2
Pioneer drill	1	1	1	1	1	1	1	1	1	1	1	1
Backhoe, 2 yd^3	1	1	1	1	1	1	1	1	1	1	1	1
Total	**11**	**23**	**24**	**25**	**25**	**25**	**25**	**24**	**24**	**24**	**24**	**24**

Note: Units owned based on fleet buildup and replacement.

2.3.2 Ore Processing

Ore processing would be the same as for the Proposed Action except for the following:

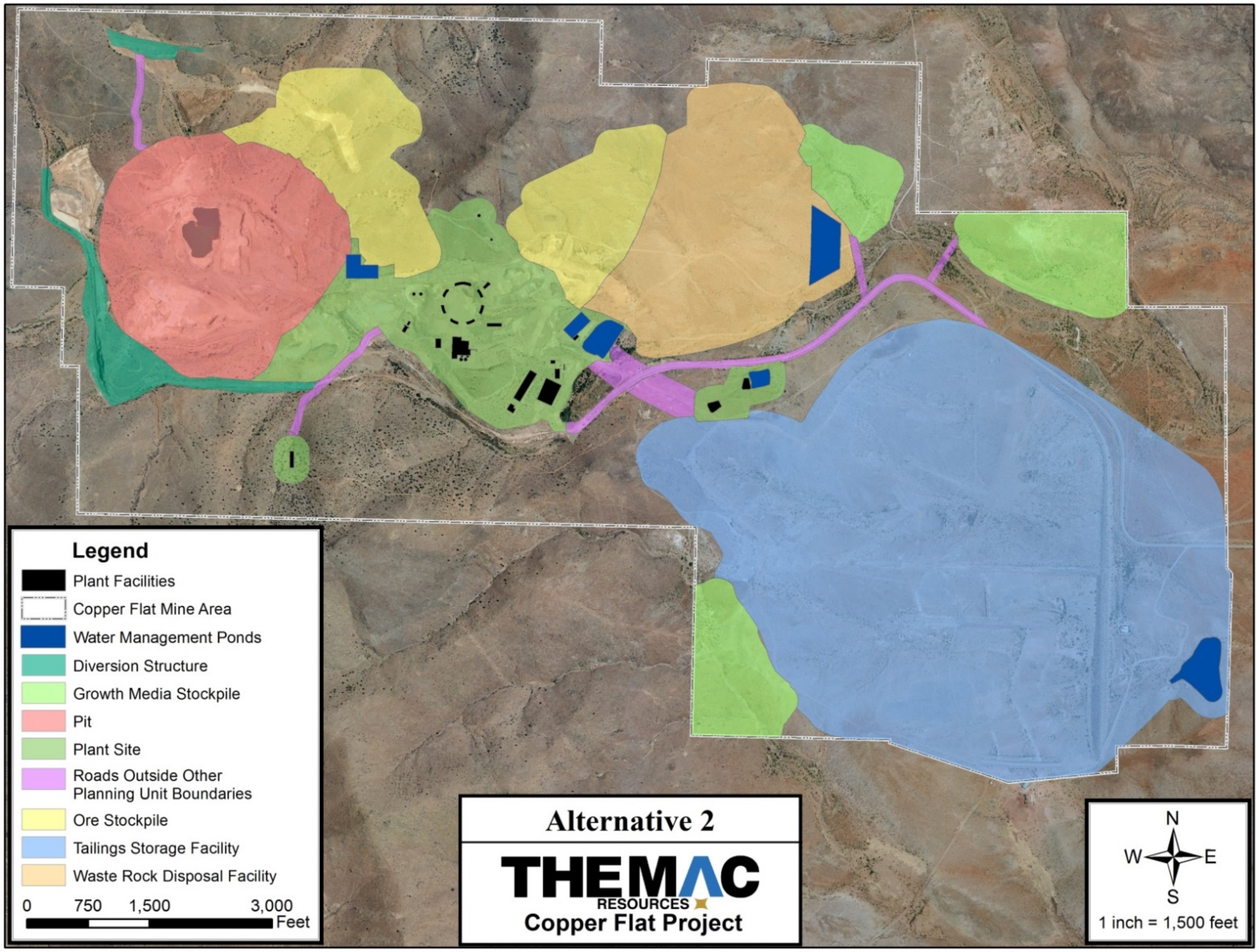
- The processing rate would be 30,000 tpd.
- Storage capacity of the lime silo would increase to 300 tons due to the increased processing rate.

The mining process for Alternative 2 is the same as Alternative 1, as described in Figure 2-7 (NMCC 2013).

2.3.3 Mine Facilities

The mine facilities would be the same as the Proposed Action with the exception of the elimination of those facilities associated with tailings thickener (concentrate thickeners, tailings cyclone thickener, and tailings glandseal water tank) (NMCC 2014a). These facilities would not be required because of the use of a gravity discharge disposal method. A general depiction of the facility layout is provided in Figure 2-11.

Figure 2-11. Mine Layout – Alternative 2



Source: NMCC 2015.

Equipment in the concentrator building is expected to consist of the following (NMCC 2014a):

- Primary Crushing – Same as Proposed Action.
- Grinding
  - One 32-foot-diameter x 14-foot-long SAG mill, 11,000 horsepower;
  - One 24-foot-diameter x 35-foot-long ball mill, 15,000 horsepower;
  - One 4.5-foot cone crusher, 300 horsepower (grinding circuit pebble crusher);
  - One vertical grinding mill, 125 horsepower (copper regrind);
  - One vertical grinding mill, 20 horsepower (moly regrind);
  - One 12- x 16-foot double deck vibrating screen;
  - One primary cyclone cluster with eight 33-inch-diameter cyclones;
  - One cyclone feed pump, 1,200 horsepower;
  - Two gravity gold concentrators;
  - One 48-inch x 470-foot-long reclaim conveyor;
  - One 36-inch x 89-foot-long SAG mill oversize conveyor;
  - One 36-inch x 257-foot-long pebble crusher feed conveyor; and
  - One 36-inch x 101-foot-long pebble crusher product conveyor.
- Flotation
  - Six 9,000-ft^3 bulk rougher flotation machines (copper/moly);
  - Fourteen 180-ft^3 cleaner flotation machines (copper);
  - Two 800-ft^3 column flotation machines (copper);
  - Eight 25-ft^3 separation flotation machines (moly);
  - Four 10-ft^3 cleaner flotation machines (moly); and
  - Two 40-ft^3 column flotation machines (moly).
- Concentrate
  - One 16-foot-diameter bulk concentrate high rate thickener (copper/moly);
  - One 16-foot-diameter concentrate high rate thickener (copper);
  - Two automatic filter presses (copper); and
  - One 4-dstph disk filter (moly).
- Tailings – Not required.

2.3.3.1 Primary Crushing Facilities

The primary crushing facility operation would be the same as for the Proposed Action.

2.3.3.2 Grinding

Grinding would be the same as for the Proposed Action.

2.3.3.3 Flotation and Concentration

Flotation and concentration would be the same as for the Proposed Action.

2.3.3.4 Tailings Storage Facility

An existing TSF at Copper Flat was constructed by Quintana Minerals to serve their 1982 mining operation. The TSF received 1.2 million tons of material and was essentially reclaimed in 1986. The TSF remains in place and is located southeast of the former plant site. As with Alternative 1, NMCC proposes to construct a new TSF to overlay the Quintana TSF area. The new TSF would occupy the site of the old facility as well as extend approximately 1,000 feet to the east of the existing Quintana starter dam. The Quintana TSF was an unlined facility. The new TSF would be underlain by a geomembrane liner and tailings drainage collection system.

Approximately 125 million tons of tailings are expected to be stored over the life of the project for this alternative. Tailings deposition would be approximately 30,000 tpd. During progressive settlement, water would be pumped from the TSF and returned to the process circuit. The total expected water recovery by reclaim systems would be a nominal 70 percent. Water reporting to the TSF would be recovered from the pool of water that would form in the storage facility and be returned to the mill process water system for reuse. Precipitation would also contribute to the volume of water in the storage facility. The height of the embankment would be designed to contain the normal operating volume of water completely within the storage facility, plus the amount of stormwater runoff from 100 percent of the probable maximum precipitation as required by the OSE.

TSF Design: The proposed method of construction for the new TSF is by centerline raises with cycloned tailings sand. Initial construction would include a toe berm to buttress the tailings embankment and a starter dam. Coarse sand (cyclone underflow) would be placed on the embankment while the tailings slimes (thickened cyclone overflow) would be discharged to the TSF interior. A geomembrane liner would be placed beneath the starter dam and anchored on the crest of the toe berm. An underdrain system would be used beneath the tailings dam and would be continuous beneath the total TSF. It would consist of (from bottom to top) prepared foundation, 12-inch liner bedding fill, 80-mil HDPE geomembrane, overliner drainage collection layer with internal drainage pipe network and a filter fabric.

The TSF would be constructed in a phased manner. During initial construction phases, diversion ditches would be constructed to divert stormwater from upstream catchment areas within the area contributory to the TSF. The contributory area is approximately equivalent to the ultimate TSF footprint, as only minor peripheral areas drain into the TSF. At final build out, minimal potential exists for surface water run-on from external areas. Throughout most of the life of the facility, stormwater management requirements would be limited to direct precipitation.

The new TSF design would comply with the design and dam safety guidelines and regulations of the OSE Dam Safety Bureau. The NMED Ground Water Quality Bureau is the permitting authority for the State of New Mexico DP program. NMED has provided guidance on anticipated design requirements for the TSF liner system, which have been incorporated into the design.

TSF Process: Tailings would be transported from a sump located at the flotation plant and delivered via slurry pipeline to the cyclone plant to be located at the northwest perimeter of the TSF. At the cyclone plant, the tailings would be cycloned.

The cyclone underflow (coarse sands) would be delivered to the TSF and used for dam construction. Two cyclone underflow pipelines would be used to deliver sand to the dam. One leg of the pipeline would run around the north side of the TSF, and the other leg would be routed around the south side of the TSF. Each leg is sized to transport 100 percent of the cyclone underflow. This allows for continuous availability of sand delivery to the dam. Cyclone underflow sand would be discharged through spigots placed every 300 to 400 feet. Each spigot would include a valve to allow manual placement of the sands on the dam as required for dam construction. The underflow pipelines would also have isolation valves strategically placed to allow for isolation and relocation of the pipe as the dam rises.

The cyclone overflow would be routed to the interior of the TSF for permanent storage. When the cyclone plant is not in operation, whole tailings would be routed directly to the TSF. Water would be reclaimed from the TSF via barge-mounted pumps placed in the supernatant pool inside the TSF as well as from the TSF underdrain collection and return system. This water would be recycled to the process water reservoir for reuse in the milling operation.

The size and location of the TSF pool would vary during the life of the project. The size of the pool would be affected by pre-deposition grading in the TSF, the amount of tailings deposited, and precipitation, evaporation rates, and flow rates into and through the underdrain system. The location of the pool would migrate within the TSF area as tailings beaches form. Tailings deposition would be managed to force the pool away from the embankment toward the upstream reaches of the TSF. The TSF area would be fenced to restrict access.

TSF Monitoring: The TSF would be regulated by the OSE Dam Safety Bureau for safety of operations. The design and operation of the TSF dam is subject to approval of the OSE, including the closure inspection. The OSE requires monthly reports of the tonnages deposited into the TSF along with readings of the piezometers, settlement devices, and settlement monuments that monitor movement.

The Ground Water Quality Bureau of NMED requires a monthly report of tonnages of tails discharged along with analyses of the tailings to identify possible contaminants. Samples of water from new monitor wells proposed for downstream of the tailings dam would be analyzed quarterly, or per specific conditions of an NMED groundwater DP, and the results sent to the NMED Ground Water Quality Bureau. These samples would be used to identify any leakage from the new, lined TSF. Abatement plans would be implemented should leakage and contamination be detected.

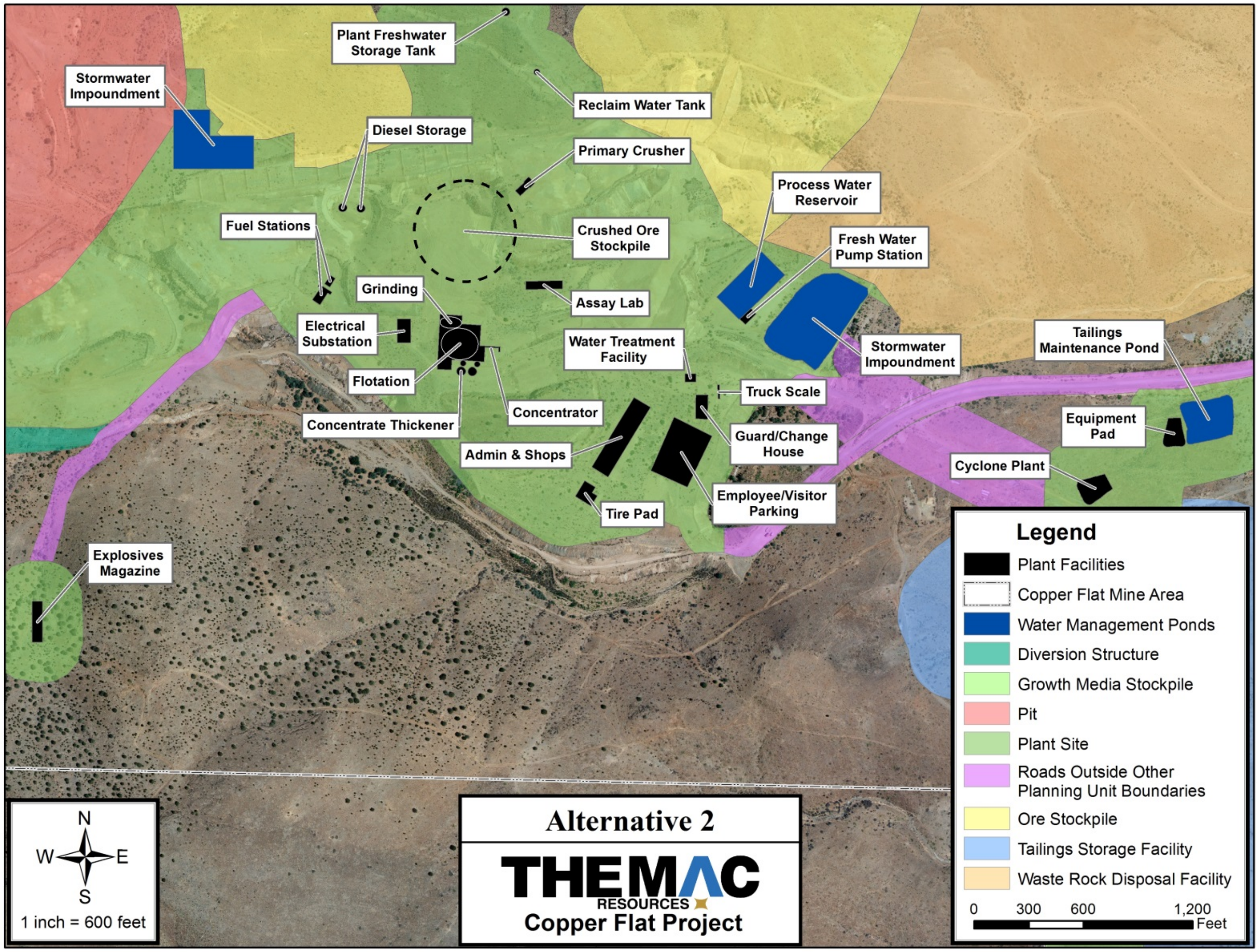
2.3.3.5 Ancillary Facilities

The ancillary facilities would be the same as for Alternative 1 with one exception. A 30-acre electrical substation site on New Mexico State Trust land is proposed to replace an existing electrical substation. (See Figures 2-12 and 2-13). The substation is described in further detail in Section 2.3.6, Electrical Power.

2.3.3.6 Sanitary Wastewater Treatment

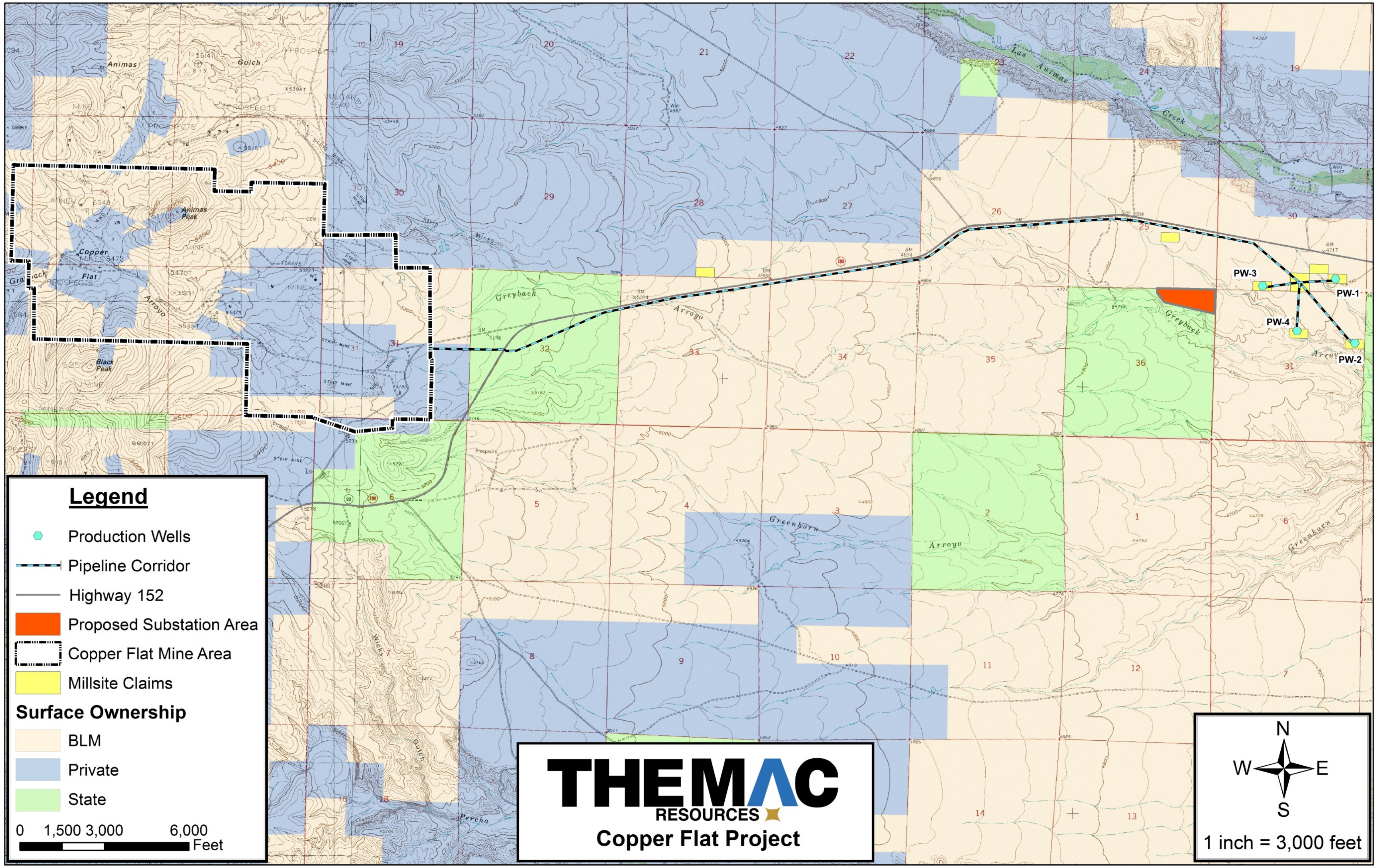
A packaged water treatment plant would be installed at the mine to accommodate liquid sanitary wastes generated from the mine office, shower, and restroom facilities. The location of the plant would be on a pre-existing concrete slab in the mine plant area (NMCC 2014a).

Figure 2-12. Mine Facilities – Alternative 2



Source: NMCC 2015.

Figure 2-13. Ancillary Facilities – Alternative 2



Source: NMCC 2015b.

2.3.4 Waste Rock Disposal Facility

As with the Proposed Action, the WRDF would be located adjacent to the open pit in an area used for waste rock disposal by the previous operator on the east side of Animas Peak. In this alternative, the disposal area would be expanded to cover approximately 155 acres and at the end of the mine life, the height of the disposal area would be at 5,725 feet above sea level. Total material contained in the WRDF at the end of the expected life of the project would be approximately 33 million tons. The low-grade stockpile would cover an area of approximately 134 acres and include about 12 million tons of rock assaying less than 0.20 percent copper. As with the Proposed Action, the WRDF would be regraded and reclaimed to blend into the surrounding topography to the extent practicable.

2.3.5 Project Workforce and Schedule

The estimated operational life required to recover the proven minerals (copper, molybdenum, gold, and silver) is 11 years. Labor requirements for the mine are displayed in Table 2-26. Increases over the Proposed Action reflected in this table are due to the higher processing rate.

Table 2-26. Mine Personnel Requirements - Year One – Alternative 2

Table 2-26. Mine Personnel Requirements - Year 1 – Alternative 2	
Work Type	**Number of Employees**
Mine salary	12
Mine operators	83
Mobile maintenance	43
Mine tech services	8
Process salary	12
Process operators	38
Process maintenance, electricians, etc.	35
Process tech services	11
Administration	28
Total Mine Workforce	**270**

Source: NMCC 2014a.

2.3.6 Electrical Power

Power for the project would be furnished by Tri-State Generation & Transmission (Tri-State) through its Member system, Sierra Electric Cooperative. Tri-State proposes to furnish power to the Copper Flat mine area via the construction of a new 345/115-kV substation that would interconnect to the existing El Paso Electric 345-kV transmission line between Springerville and Macho Springs substations, and the existing Tri-State 115-kV transmission line between Caballo substation and the mine. The existing Tri-State 115-kV transmission line previously served the mine area until the 1980s and is not in service at this time.

The new substation is planned as a 345-kV, three-breaker ring bus substation, expandable to a future breaker-and-a-half configuration, with a 345/115-kV, 100 mega volt amp (MVA) transformer bank and single breaker on the 115-kV low-side. This new primary substation would be located on a 30-acre site on State Trust land south of NM-152 and east of the production wells.

Utilizing this new substation at the intersection of the 345-kV line and the 115-kV line, Tri-State would deliver power to the mine area via their existing 115-kV transmission line. Initial assessment indicates some pole replacement and structure modifications would be required in order for the transmission line to carry the Copper Flat mine's expected 40 megawatts (MW) of load. Tri-State would also require that a new 115-kV switch be installed at the Copper Flat mine.

For most aspects of the operation, unit power demand (kilowatt hours per ton [kWh/ton]) is constant between all plans. This is the result of unit operations and material processed being the same between all plans. The difference between the three plans is seen when power demand is presented as total power used in a given time period (hour, day, or year.). Power used is a function of the processing rate and therefore the power need for a specific period increases as more tons are processed in that same period. Because of the increased processing rate, the electrical demand would increase and the plant electrical load requirement for 30,000 tpd processing rate (10.8 million tpy) is tabulated in Table 2-27.

Table 2-27. Summary of Project Electrical Demand – Alternative 2

Activity	**Power Demand (kWh/ton)**	**Power Demand (GWh*/Year)**
Crushing	0.38	4.10
Grinding	15.71	169.67
Flotation	2.50	27.00
Molybdenum plant	0.14	1.51
Concentrate filtering	0.16	1.73
Tailings system	0.50	5.40
Reagent system	0.24	2.59
Water system	2.69	29.05
Ancillary facilities	0.04	0.43
Total	**22.36**	**241.49**

Source: NMCC 2014a.

* = gigawatt hours.

As with the Proposed Action, a new secondary substation for mine operation would be constructed within the mine area. Also an emergency generator would be installed on-site for backup power in the event of power loss to maintain critical systems and to aid in a controlled shut down. On-site power distribution would include one 25-kV distribution line. Because the configuration and size of these distribution lines, standard raptor proof protective designs would be incorporated into the line design and line upgrade, as presented in the Rural Electrification Administration guidelines. This design would be used for the entire length of the distribution line within the mine area.

2.3.7 Water Supply

The water supply descriptions and defining classifications for Alternative 2 are the same as the Proposed Action. Differences between Alternative 2 and the Proposed Action would be evident in quantities of water use and supply.

2.3.7.1 Water Use

Total water use under Alternative 2 for the Copper Flat mine, including all recycled water, would be approximately 22,210 AF on a yearly average basis. Total water use is presented in Table 2-28.

Table 2-28. Total Water Use* – Alternative 2

Table 2-28. Total Water Use* - Alternative 2		
	Alternative 2	**Proposed Action**
Average annual water use (AF)	22,210	13,370
Average water used to process 1 ton of material (gallons)	632	633
Total water use – life of mine (AF)	254,000	209,000

Note: * Includes recycled water

Ninety-six percent of this water would be used for processing copper ore. The other 4 percent of water use would be for dust control, maintenance, laboratory and domestic use. Average annual water use by process is presented in Table 2-29.

Table 2-29. Water Use by Process* – Alternative 2

Table 2-29. Water Use by Process* - Alternative 2				
	Acre-Feet per Year			**Percent of Total**
Water Use	**Recycled**	**Non-recycled**	**Total**	
Ore Processing:				
Reclaimable TSF water	15,504	0	15,504	70%
Water retained in tailings	0	4,973	4,973	22%
Evaporation	0	752	752	3%
Concentrates	0	13	13	<1%
Subtotal	**15,504**	**5,738**	**21,242**	**96%**
Dust control	0	726	726	3%
Other	0	242	242	1%
Total Use	**15,504**	**6,706**	**22,210**	**100%**

Notes: * Includes recycled water use.
Columns may not sum exactly due to rounding.

2.3.7.2 Water Sources

Table 2-30 and Figure 2-14 summarize the water sources that would be used at Copper Flat under Alternative 2.

Process Water Sources: The source, description, and operation of the process water sources under Alternative 2 would be the same as described in the Proposed Action. Process water sources would provide 16,105 AFY of water used by this alternative, which would be 72 percent of the total need. Stormwater management and use would be the same as described in the Proposed Action. Pit water management and use would be the same as described in the Proposed Action.

Table 2-30. Water Sources* – Alternative 2

Table 2-30. Water Sources* - Alternative 2				
	Acre-Feet per Year			Percent of Total
Water Source	Recycled	Non-recycled	Total	
Process Water:				
Water reclaimed from TSF	15,504	0	15,504	70%
Stormwater	304	0	304	1%
Moisture in the ore	258	0	258	1%
Pit dewatering	39	0	39	>1%
Subtotal	**16,105**	**0**	**16,105**	**72%**
Fresh water (groundwater wells)	0	6,105	6,105	28%
Total Use	**16,105**	**5,290**	**22,210**	**100%**

Notes: * Includes water from recycled water sources.
Columns may not sum exactly due to rounding.

Fresh Water Source: The source and operation for fresh water supply and delivery to the mine under Alternative 2 would be the same as described in the Proposed Action. The description of the four production wells and delivery system is the same as described in the Proposed Action. Fresh water would provide for 6,105 AFY (28 percent) of the total water use for this alternative.

2.3.7.3 Water Conservation

Water conservation activities under Alternative 2 would be the same as described in the Proposed Action.

2.3.7.4 Water Recycling

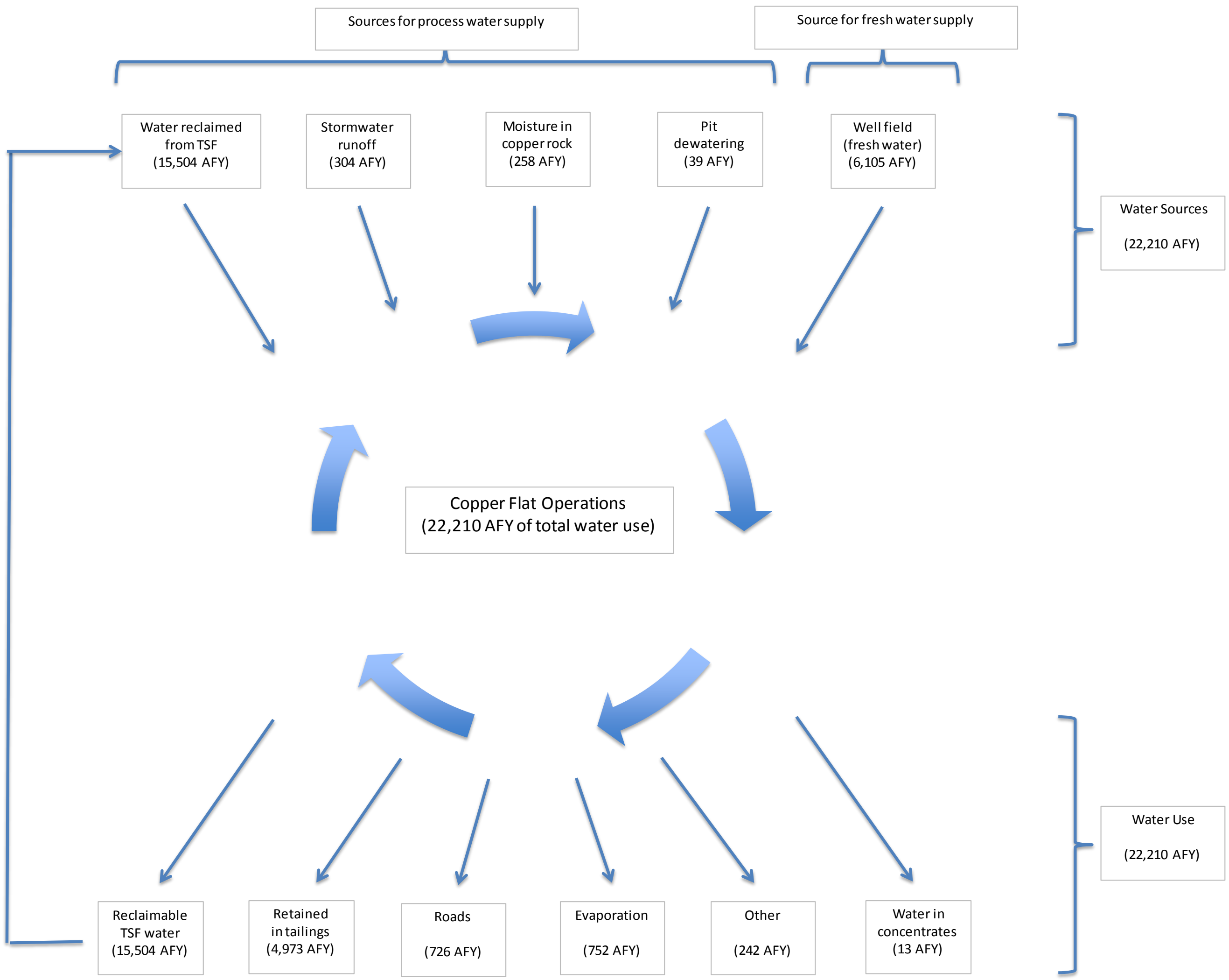
Alternative 2 proposes a package wastewater treatment plant to process domestic wastewater versus septic systems proposed in the Proposed Action and Alternative 1. Following treatment, plant effluent would be reused as process make-up water or for dust control as allowed by regulation in order to reduce fresh water needs. Assuming 200 personnel and visitors are typically on-site on a daily basis and assuming a usage rate of 25 gallons of water per day per person, gray water reuse would supply approximately 5,000 gallons of water per day (about 5.6 AFY).

All other water recycling activities would be the same as described in the Proposed Action.

2.3.7.5 Decreasing Water Demand

Activities to decrease water demand under Alternative 2 would be the same as described in the Proposed Action.

Figure 2-14. Copper Flat Water Sources and Water Use – Alternative 2



Source: THEMAC 2015.

2.3.8 Growth Media

Growth media would be addressed in the same manner as the Proposed Action.

2.3.9 Borrow Areas

Borrow areas with this alternative would be addressed the same as with the Proposed Action.

2.3.10 Inter-Facility Disturbance

Inter-facility disturbance with this alternative would be the same as with the Proposed Action.

2.3.11 Fencing and Exclusionary Devices

Fencing and exclusionary devices employed with this alternative would be the same as with the Proposed Action.

2.3.12 Haul Roads and On-Site Service Roads

Haul roads and on-site service roads with this alternative would be the same as with the Proposed Action.

2.3.13 Transportation

Transportation measures employed with this alternative would be the same as with the Proposed Action. Exceptions would be for increased levels of activities for concentrate shipments because of the increased processing rate.

- Copper concentrate shipment schedule (hauling weekdays only) would be:
  - Years 1–6+ ship: 14 to 19 truckloads per day, 5 days per week.
- Molybdenum concentrate shipment schedule (hauling weekdays only) would be:
  - Life of mine: ship three truckloads per month (NMCC 2014a).

2.3.14 Exploration Activities

The exploration activities with this alternative would be the same as with the Proposed Action.

2.3.15 Reclamation and Closure

The reclamation and closure measures employed with this alternative would be the same as with the Proposed Action with one exception:

Ancillary Project Facilities: All surface pipelines, poles, and commercial signage would be removed. At time of closure, the BLM would determine whether buried pipelines and electrical conduits would be left in place.
Solution flow from underdrainage during ore processing under this alternative would be 1,800 gpm, and the draindown rate at 6 months following process shutdown would be 1,200 gpm.

2.3.16 Environmental Protection Measures

The environmental protection measures employed with this alternative would be the same as with the Proposed Action with these exceptions:

- In reagent management, there would not be any use of AERODRI 100 (ethanol, sodium dioctyl sulfosuccinate, and 2-ethylhenanol).
- This alternative proposes a package treatment plant for on-site water treatment of water used in sanitary facilities and offices. Following treatment, plant effluent would be reused either as process make-up water or used for dust control as allowed by regulation, which would reduce fresh water needs. Assuming 200 personnel and visitors are typically on-site on a daily basis and assuming a usage rate of 25 gallons of water per day per person, gray water reuse would supply approximately 5,000 gallons of water per day (about 5.6 AFY).
- A 30-acre electrical substation site on New Mexico State Trust land is proposed to replace an existing electrical substation. Because this land would be disturbed, NMCC has performed cultural resource, wildlife, vegetation, and paleontology surveys to establish baseline conditions for these ancillary facilities as a basis for further evaluation.

2.4 NO ACTION ALTERNATIVE

NEPA requires consideration of a “no action” alternative. Under the No Action Alternative, the project would not be constructed and NMCC’s proposed open pit mining operations would not occur. The environmental, social, and economic conditions described as the affected environment would not be affected by the construction, operation, reclamation, or closure of the mine. Local employment and economic revenue would not increase as a result of this alternative. Existing uses such as grazing and recreation would continue at current levels. The mine area would be reclaimed according to BLM standards, and to NMED requirements pertaining to disturbances associated with site exploration.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED

NEPA provides guidance on the development of alternatives. Reasonable alternatives include those “that are practical or feasible from technical and economic standpoints and using common sense, rather than simply desirable from the standpoint of the applicant” (CEQ 2007). All reasonable alternatives must fulfill the project’s purpose and need and must address significant environmental issues. The selection of alternatives under NEPA criteria includes consideration of a reasonable range of alternatives that meet the project purpose and need and that are economically and technically feasible.

A number of alternatives suggested during scoping have been eliminated from detailed study. These alternatives were evaluated using the following criteria to determine if further review was necessary. According to the BLM NEPA Handbook an action alternative can be eliminated from detailed analysis if:

- It is ineffective (it would not respond to the purpose and need).
- It is technically or economically infeasible (consider whether implementation of the alternative is likely given past and current practice and technology; this does not require cost-benefit analysis or speculation about an applicant’s costs and profits).
- It is inconsistent with the basic policy objectives for the management of the area (such as, not in conformance with the land use plan).
- Its implementation is remote or speculative.

- It is substantially similar in design to an alternative that is analyzed.
- It would have substantially similar effects to an alternative that is analyzed.

Based upon these criteria, the following alternatives were considered but eliminated from further study.

2.5.1 Dry Stack Tailings Disposal

Dry stack tailings disposal was considered as an alternative to the conventional method proposed in order to achieve the following potential benefits (note: collectively, M3 (2012) and CDM Smith Inc. (2013) are the sources for this section):

- Reduction of water consumption;
- Avoidance of the permitting, construction, and operation of a tailings dam regulated by the OSE;
- Allowance for concurrent reclamation to reduce erosion of stored tailings and mitigate the visual impact of the TSF; and
- Potential reduction of the footprint area of the TSF.

Dewatering tailings to higher degrees than paste produces a filtered wet (saturated) and dry (unsaturated) cake. These filtered tailings are normally transported by conveyor or truck, deposited, spread, and compacted to form an unsaturated tailings deposit. This type of tailings storage produces a stable deposit usually requiring no retention binding and is referred to as ‘dry stack.’ Three dry stack options were considered:

- Option 1: Dry stack tailings with a waste rock buttress;
- Option 2: Dry stack tailings mixed with waste rock; and
- Option 3: Dry stack tailings with no buttress.

Under option 1, waste rock would be transported with mine haul trucks to the TSF to create a buttress against which the tailings are stacked, reducing the amount of waste rock that is transported to the WRDF. Under option 2, waste rock would be sized (crushed) at the edge of the pit and transported via conveyor to the filter plant where it would be combined with tailings for stacking, nearly eliminating waste rock transported to the WRDF. Option 3 reduces the slope angles to enable placement of dry stack tailings without a buttress.

These options were developed for the construction of the dry stack TSF in order to assess the process and how it would affect slope stability, compaction requirements, and area of impact. These options were also developed to assess costs associated with preparation of the foundation of the TSF, construction of ponds and drainage diversions to contain liquids and sediments impacted by the tailings, and diversion of stormwater from running onto the TSF.

For each of the options, mining and processing of the ore would be the same. Distinctions occur in the waste rock handling, water supply, water reclamation, stormwater management, and tailings disposal aspects of the project. Under the Proposed Action, a thickener would be used, and process water would be reclaimed at the TSF in a seepage collection system and from a supernatant water pond on the surface of the TSF (thickeners would not be used in either of the alternatives). Under the dry stack options, a high-rate thickener, filter plant, and conveying system would be used to enable stacking of dry tailings at the TSF. Water would be reclaimed at the thickener with a contribution of water recovered from the filter plant. More water would be reclaimed in the dry stack options, reducing the amount of fresh make-up water needed to be pumped from the well field.

The dry stack option differs from the Proposed Action from downstream of the concentrator building. The tailings slurry would be thickened and filtered before being discharged to a conveying system for delivery and stacking of the tailings on the dry stack TSF.

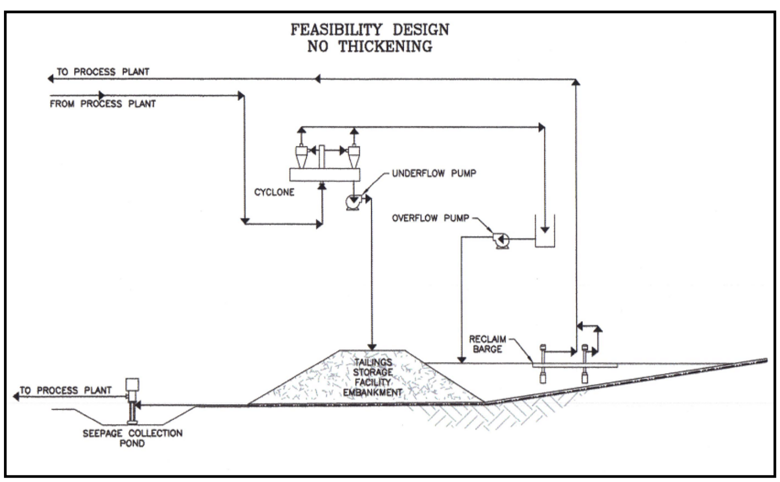
Additional equipment required under this option includes a high-rate tailings thickener and six plate-and-frame tailings filters with associated piping, pumps, tanks, agitators, and conveyors.

Tailings would flow by gravity from the concentrator tailings sump to the tailings thickener. A high-rate thickener would be used to decrease the water content from 70 percent to approximately 35 percent. Water content would then be reduced to approximately 15 percent by plate-and-frame filtration and conveyed by a stationary and mobile conveyor system to a mobile stacker. The underflow of thickened tailings would gravity flow to the tailings filter feed tank. A tailings filter feed pump would then be used to transfer the thickened tailings to one of six tailings filters. The tailings would be dewatered to a moisture range of 12 to 18 percent before discharging the filter cake to the accompanying tailings filter discharge conveyor. Water reclaimed from the thickening and filtering processes is estimated to total 10,475 gpm.

Dewatered tailings would be discharged from these conveyors to the tailings transfer conveyor, which discharges either to the stacking system or bypass stockpile served by a fixed stacker. Tailings would be stockpiled at this location when the mobile stacking system is down and moved by heavy equipment to their final location on the TSF. Under normal operations, discharge from the tailings transfer conveyor would go to the mobile stacking system, which consists of a fixed conveyor to the central portion of TSF, a series of “grasshopper” mobile conveyors, and to a mobile stacker that would place the tailing on the surface of the TSF. Tailings would be placed in 25-foot lifts. Water recovered from the filter plant would then be pumped back up to the tailings thickener for settling and reclamation. Dry stack tailings storage would allow for the lower slopes of the TSF to be reclaimed while the upper portion is in operation (concurrent reclamation).

Dry stack tailings would incur increased operating costs for the thickener (flocculant), filtration, and tailings conveying and stacking, but would be partially reduced by the decreased pumping cost for water supply and reclamation and operation of the tailings cyclone plant. Dry stacking also requires additional water consumption for dust suppression because the tailings are deposited with low moisture content. Dry stack operations depend upon the operation of the filter plant to remain in production. A failure in the filter plant would require the entire plant to shut down because there is no alternative for tailings disposition.

Additionally, the dry stack tailings disposal method is not considered reasonable because its implementation is economically infeasible (reducing investment rates below 15 percent).

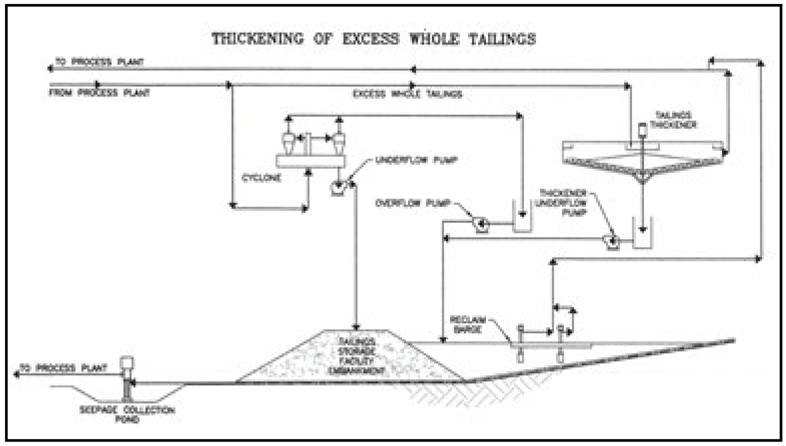


2.5.2 Tailings Thickener Alternatives

Another set of alternatives that was considered was the use of tailings thickeners at various stages in the tailings storage process to enhance water conservation.

The Copper Flat TSF water balance model has water inputs from the tailing overflow and underflow, direct precipitation within the TSF limits, and precipitation run-on from un-diverted up-gradient areas. The model has water losses of evaporation from the supernatant pond, the tailings beach, the sand embankment areas, and water locked-up or entrained within the tailings mass. Of these losses, the most significant is the water locked-up or entrained within the tailings mass.

Additional water conservation can be achieved by reducing the volume of water loss due to lock-up. Water loss due to lock-up is a function of the density and saturation of the tailings mass. By increasing the density of the tailings, the volume of water loss is reduced, assuming no change in tailings saturation. One method of achieving an increase in the tailings density is to thicken the slurry being deposited. The following sections present alternatives to the process flow in which a thickener would be added to the process at different stages. Specific aspects of the alternatives discussed in this section differ from the procedure suggested in the Proposed Action, but the same operating principals, risks, and opportunities apply to all tailings thickener alternatives, including the Proposed Action. All of these alternatives were eliminated from further consideration because they would be at a level of a return on investment that would be considered economically infeasible.



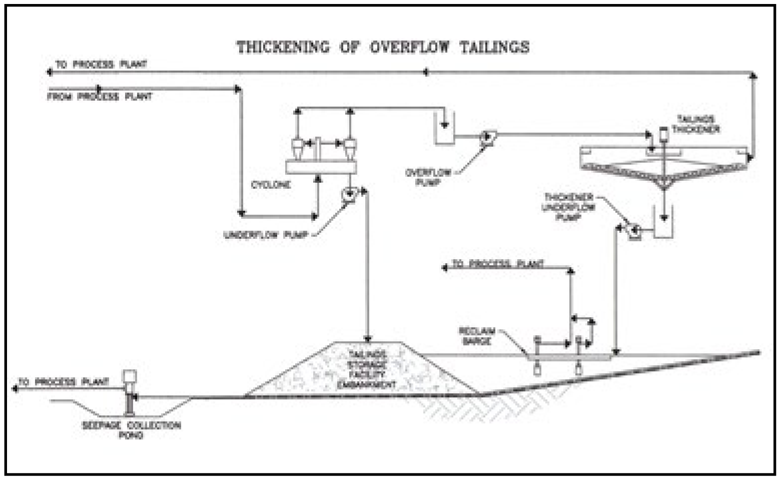
Thickening Excess Whole Tailings: In this alternative, tailings which do not require cycloning would be routed through a high-rate thickener prior to deposition within the TSF. The thickener would allow reclamation of water within the mineral processing circuit prior to tailings deposition into the TSF. Thickening the whole tailings that did not have to be cycloned would reduce the volume of water deposited and therefore reduce the potential loss of water due to evaporation and water locked-up in the tailings.

Current analysis shows a need for increasing the volume of sand needed for the TSF embankment. This leads to a reduction in the amount of whole tailings that can run through tailings thickener and makes the TSF embankment larger. The estimate for the additional volume of sand required for the TSF embankment would be 44.76 tons, a substantial increase. In order to produce this required sand volume, the cyclone plant must operate 96.5 percent of the time.

Based on the volume of sand required to construct the TSF embankment, this alternative is not considered technically viable. For the current configuration, the only tailings that would be processed by the thickener are those produced during the 3.5 percent of the time that the cyclones are not operating (this equates to approximately 4 tons of tailings over the mine life).

Thickening Cyclone Overflow: This alternative incorporates a thickener after the tailings have been processed by the cyclones. The underflow tailings (sand) would be pumped to the TSF for use in constructing the embankment, as currently proposed. However, the overflow tailings would be pumped to a thickener which would reclaim some of the water, thereby increasing the solids content of this tailings stream. The thickened overflow tailings would then be pumped to the TSF for deposition.

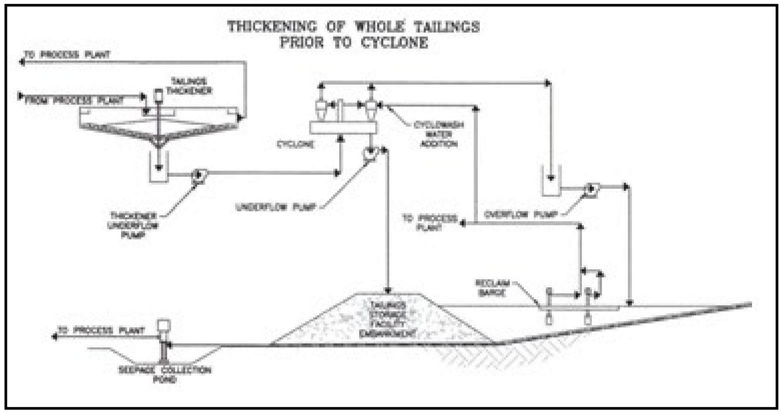
In this alternative, it has been assumed that a thickener is used to increase the solids content of the overflow tailings from 19.6 to 50 percent. This could result in a density increase on the order of 5 to 11 pounds per cubic foot during the operating life of the facility. If a density increase of 8 pounds per cubic foot is assumed, the water loss due to lock-up during operations is estimated to be reduced by approximately 15 percent. This calculation assumes that the thickener is 100 percent efficient in the production of thickened tailings and available 100 percent of the time. Since it is not reasonable to assume that the equipment would not encounter operational upsets or have down-time for maintenance, it is reasonable to assume that the actual realized water conserved with this alternative would be on the order of 10 to 12 percent of the total water reclaimed from the TSF. In order to achieve the thickening of the overflow tailings as stated above, a thickener with a diameter in the range of 250 feet would be required. Alternatively, two thickeners with diameters in the range of 175 to 200 feet could be used in order to improve availability and reduce the likelihood of unthickened tailings being deposited into the TSF.



Flocculants would be required to be utilized in the thickener operation with a dosing rate on the order of 25 grams per ton of ore. There would be significant operational risk associated with this alternative. Additional complexity is added to the operations which would require additional personnel, metering, and monitoring components. Approximately 85 percent of the material would be smaller than 75 microns and 60 percent of the material will be smaller than 37 microns. This would mean the overflow tailings would be a very fine-grained tailings material. The lack of sand and coarser materials in the overflow tailings increases the time the tailings are in the proposed thickener and the amount of flocculants required to be used in order to achieve the desired solids content. Normal variation in the tailings production rate at either the processing or cyclone plant would likely result in upset conditions at the thickener or thickened tailings being at a lower than desired density. In order to prevent a release of tailings or process solutions during these upset conditions, some portion of the overflow tailings would bypass the thickener and be deposited directly into the TSF. The result would be that the desired water conservation is not achieved. Additional operational risks include pumping fine-grained tailings back to the processing plant. This would result in the process pond filling with slimes and increasing the risk of a process solution release due to reduced capacity of the pond. It would also result in an economic risk associated with a degraded copper concentrate and a lower amount of copper in the concentrate.

Thickening Whole Tailings Prior To Cycloning: This alternative incorporates a thickener before the tailings have been processed by the cyclone plant, at the very beginning of the process. The whole tailings would be thickened, reclaiming water within the mineral processing circuit. The tailings would then be pumped to the cyclone plant for underflow/overflow separation prior to discharging into the TSF. The tailings would be thickened to 50 percent prior to pumping to the cyclone plant. The underflow tailings are required to have less than 20 percent fine particles in order adequately drain. The thickened whole tailings, when cycloned, would generate underflow tailings with more than 31 percent fine particles. Therefore, modification to the proposed cyclone plant would be required in order to produce underflow tailings which meet the required geotechnical characteristics.

These tailings could be processed with a cyclowash added to each cyclone. The cyclowash is an additional component added to the cyclone which allows water to be added directly into the cone of the cyclone. This additional water facilitates the overflow/underflow separation and increases the amount of fine particles which are removed from the underflow tailings. In general terms, the whole tailings would be thinned out during the cycloning process after they have been thickened at the processing plant. The water required by the cyclowash could be supplied by the water recovered from the supernatant pond and seepage pond. Additional piping, valves, controls, and operating staff would be required to incorporate this equipment and ensure the system is operating properly.



Similar to thickening of cyclone overflow, the estimated reduction in water loss for this alternative assumes 100 percent efficiency and availability of the cyclowash equipment. If this is not achieved, neither the underflow nor the overflow tailings produced would meet the design requirements. This would result in an insufficient volume of sand being produced to construct the embankment or areas within the embankment having sand which have fine particles contents in excess of 20 percent. Both of these are significant risks that should be considered before incorporating into the design and operation as they could require significant time, effort, and costs to mitigate. An insufficient volume of sand would require a change in the embankment design and possible importation of embankment fill materials. If the cyclowash equipment did not produce the required quality of sand, it is possible that additional drains in the embankment would be required in order to prevent elevated pore pressures and instability from developing.

2.6 SUMMARY

Table 2-31 summarizes the differences between each of the alternatives—Proposed Action, Alternative 1 (Accelerated Operations – 25,000 Tons per Day), Alternative 2 (Accelerated Operations – 30,000 Tons per Day), and the No Action Alternative. Table 2-32 presents the assessed impacts associated with the Proposed Action and each alternative for each resource area. A more complete description of the impacts is provided in Chapter 3.

Table 2-31. Summary of Differences Between All Alternatives

Table 2-31. Summary of Differences Between All Alternatives		
Change from No Action to Proposed Action	**Change from Proposed Action to Alternative 1**	**Change from Proposed Action to Alternative 2 (Preferred Alternative)**
• General scale and scope of the operation • Mining process o Open pit o Drill, blast, loader, truck o Type of equipment used • Mineral beneficiation process o Crush, grind, sulfide flotation, concentrate filtering o Type of equipment used • Tailings storage o Conventional slurry o Raised TSF o Centerline construction with tails sand o Fully lined o Monitoring systems • Type of mine & process equipment used • Three final products o Copper concentrate with gold & silver o Molybdenum concentrate o A small amount of coarse gold concentrate • Concentrate handling, shipping methods, shipping route, destination • Operating schedule (24 x 7) • Size of the mine area • Location and siting of the proposed facilities • Reuse of existing infrastructure and site grading • Reuse of existing diversion structures • Ongoing exploration • Concurrent reclamation practices • Reclamation standards and methods (with updates to new regulations) • Planned water conservation activities standard aspect of operating plan • Water source, storage, and delivery/distribution systems • Surface and groundwater protection methods	• Process rate increased to nominal 25,000 tpd to improve project economics • Mine life shortened to 11 years due to higher process rate • Whole tailings thickener removed from tailings flowsheet in order to improve TSF stability • Non process water use decreases due to more efficient designs • Annual water use increases due to higher process rate • Duration of water use decreases due to higher process rate • Total water use over life of mine increases slightly due to higher process rate • Total disturbance footprint reduced due to more efficient design • Number and disturbance footprint of rock storage piles reduced due to more efficient design • Power requirements increase due to increased process rate • Concentrate loads trucked on NM-152 and US I-25 increase due to higher process rate	• Process rate increased to nominal 30,000 tpd to further improve project economics to meet minimum finance requirements • Total life of mine tons processed increased 25 million tons due to exploration success • Mine life shortened to 11 years due to higher process rate • Whole tailings thickener removed from tailings flowsheet in order to improve TSF stability • Non process water use decreases due to more efficient designs • Annual water use increases due to higher process rate • Duration of water use decreases due to higher process rate. • Total water use over life of mine increases slightly due to higher process rate. • Total disturbance footprint reduced due to more efficient designs • Number and disturbance footprint of rock storage piles reduced due to more efficient design • Power requirements increase due to increased process rate. • Alternate power source selected • Concentrate loads trucked on NM-152 and US I-25 increase due to higher process rate • Lime silo increased to 300-ton capacity due to increased processing rate. • Mine workforce increases due to increased process rate • A package wastewater treatment plan proposed instead of septic tanks and leach field

Table 2-31. Summary of Differences Between All Alternatives (Concluded)		
Change from No Action to Proposed Action	**Change from Proposed Action to Alternative 1**	**Change from Proposed Action to Alternative 2**
• Standards for groundwater monitoring around facilities • Power, transmission, and distribution systems • Growth media borrow and storage plans • Fencing and exclusionary devices • General viewshed • Construction workforce required • Construction and mine workforce skill requirements • No heap leach • No on-site smelting/refining • No placer mining		• Reclamation & closure: At time of closure, the BLM would determine whether buried pipelines and electrical conduits would be left in place.

Table 2-32. Summary of Impacts

Table 2-32. Summary of Impacts			
Resource Area	**Proposed Action**	**Alternative 1**	**Alternative 2 (Preferred Alternative)**
Air Quality	Not Significant	Not Significant	Not Significant
Climate Change and Sustainability	Not Significant	Not Significant	Not Significant
Water Quality	Not Significant	Not Significant	Not Significant
Surface Water Use	Significant	Significant	Significant
Groundwater Resources	Significant	Significant	Significant
Mineral and Geologic Resources	Significant	Significant	Significant
Soils	Significant	Significant	Significant
Hazardous Materials and Solid Waste/Solid Waste Disposal	Not Significant	Not Significant	Not Significant
Wildlife and Migratory Birds	Not Significant	Not Significant	Not Significant
Vegetation, Invasive Species, and Wetlands	Significant	Significant	Significant
Threatened and Endangered Species/Special Status Species	Not Significant	Not Significant	Not Significant
Cultural Resources	Significant	Significant	Significant
Visual Resources	Significant	Significant	Significant
Land Ownership and Land Use	Not Significant	Not Significant	Not Significant
Recreation	Not Significant	Not Significant	Not Significant
Special Management Areas	Not Significant	Not Significant	Not Significant
Lands and Realty	Not Significant	Not Significant	Not Significant
Range and Livestock	Significant	Significant	Significant
Transportation and Traffic	Significant	Significant	Significant
Noise and Vibrations	Not Significant	Not Significant	Not Significant
Socioeconomics	Significant	Significant	Significant
Environmental Justice	Significant	Significant	Significant
Human Health and Public Safety	Not Significant	Not Significant	Not Significant
Utilities and Infrastructure	Not Significant	Not Significant	Not Significant
Paleontology	Not Significant	Not Significant	Not Significant

2.7 BEST MANAGEMENT PRACTICES

BMPs involve either industry standard practices accepted as indicators of good quality performance or are adopted by NMCC as standard operating procedures to be implemented regardless of potential effects to resources that may result from mining activities. The BMPs to be implemented are summarized below, grouped by the resource most relevant to them. For clarity, the BMPs are again described in Chapter 3 within the resource section for which they primarily apply.

Air Quality:

- Water would be applied on haul roads and other disturbed areas and other dust control measures would be used as per accepted and reasonable industry practice.
- Disturbed areas and stockpiles would be seeded with an interim seed mix to limit fugitive dust emissions from unvegetated surfaces where appropriate.
- Crusher and conveyor drop points would utilize NMED and MSHA-approved Sonic Misting System, which are considered to be the Best Available Control Technology (BACT).
- Deposition of tailings would utilize spigotting or cyclone discharge. Using this procedure the surface would be wet, thereby eliminating or reducing fugitive dust.
- The lime storage would be fitted with a baghouse for capture of fugitive dust during loading of the lime bin. The sample preparation lab would be equipped with fans and filters.
- As necessary, control of fugitive dust in the vicinity of the tailings pond would be attained by watering, sprinkling, and vegetation.
- Drilling operations would be done wet or with other efficient dust control measures as set by the MSHA/the New Mexico State Mine Inspector's Office, and New Mexico mining and exploration permit requirements.
- Combustion emissions from mobile mining machinery and support vehicles would be controlled by manufacturer pollution control devices.

Water Quality:

- Methods would be used to limit erosion and reduce sediment in runoff during construction, operations, and initial stages of reclamation and would include:
  - Surface stabilization measures — dust control, mulching, riprap, temporary and permanent revegetation/reclamation and restoration, and placing growth media;
  - Runoff control and conveyance measures — hardened channels, runoff diversions; and
  - Sediment traps and barriers check dams, grade stabilization structures, sediment detention, sediment/silt fence and straw bale barriers, and sediment traps.
- Stormwater pollution would be managed using seeding and mulching of disturbed areas, silt fences, straw bale check dams, diversion ditches with energy dissipaters, and rock check dams.
- Surface runoff from the area around the administration/mine office, concentrator, assay building, reagent storage, and tailings thickener would be controlled by surface grading and directed to a containment pond to be used for mineral processing make-up water or dust control at the site.
- Water erosion controls, such as berms and diversion ditches, would divert runoff away from the WRDFs and control water inflow onto waste rock disposal piles.
- Runoff from the WRDFs and the low-grade ore stockpile would be controlled by diverting the runoff water into collection ditches and then recycling it into the process water system. No discharge is expected to occur from the WRDFs.
- The final grading plan for the WRDFs would be designed to eliminate surface water run-on, improve runoff, reduce infiltration, minimize visual impacts, and facilitate revegetation

through back-grading or crowned grading. Surface runoff velocity dissipaters would be constructed to reduce velocities and minimize undue erosion and soil loss.

- The bottom of the TSF is lined and an underdrain seepage return system is used to prevent seepage of tailings liquids into underlying groundwater.
- Chemicals used in the mining process would be stored out of the elements and with containment provisions, as required, to prevent release of harmful chemicals to the environment.
- An SPCC plan would be developed to manage spills and prevent releases to the environment.

Surface Water Use:

- NMCC would use diversions, berms, and other BMPs to prevent stormwater from areas outside the mine from running on to mine areas and facilities.

Mineral and Geologic Resources:

- Surface stabilization measures would be employed, including dust control, mulching, riprap, temporary and permanent revegetation/reclamation, and placing growth media.
- Runoff control and conveyance measures – hardened channels, runoff diversions.
- Sediment traps and barriers – check dams, grade stabilization structures, sediment detention, sediment/silt fence and straw bale barriers, and sediment traps.
- Revegetation of disturbed areas would reduce the potential for wind and water erosion. Following construction activities, areas such as cut and fill embankments and growth media/cover stockpiles would be seeded as soon as it is practicable and safe. Contemporaneous reclamation would be used to the extent practicable to accelerate revegetation of disturbed areas.
- All sediment and erosion control measures would be inspected periodically and repairs performed as needed.

Wildlife and Migratory Birds:

- Consideration would be given to neighbors regarding their land use requirements including cattle grazing, alternate energy generation such as wind and solar, and reestablishment and enhancement of original botanical and zoological species inhabitants.
- During the course of operations, NMCC would periodically review and update the geochemical and hydrogeological predictions, mine waste characterization studies, and pit lake studies to incorporate new information accumulated during operations to minimize impacts to wildlife.
- NMCC would construct BLM-approved barbed wire fencing to prevent livestock from entering the pit, WRDFs, and TSFs, including the seepage collection pond. Fences of appropriate height would be constructed around lined water and solution ponds to keep out larger wildlife such as deer and antelope.
- To the extent practicable, NMCC would investigate and utilize other mitigation actions, such as exclusionary devices. These devices could include, but are not necessarily limited to, bird balls and netting, to prevent deleterious exposure of birds to toxic chemicals or conditions used or created by mining and mineral processing operations.
- Pending monitoring information, either gates or cattle guards or both would be installed along roadways within the proposed mine area as appropriate.

Vegetation and Non-native Invasive Species:

- All equipment would be pressure washed before being moved on-site to eliminate the possibility of introduction of noxious weeds.
- On-site biological monitoring in areas of noxious weed concern or presence would be conducted before, during, and after project activities. NMCC would be responsible for providing the monitoring.
- Vehicle and equipment parking would be limited to within construction limits or approved staging areas.
- Heavy equipment would be cleaned and weed-free before entering the mine area.
- Monitoring and follow-up treatment of exotic vegetation would occur after project activities are completed.
- All gravel and fill material imported on-site must be source-identified to ensure that the originating site is noxious weed free.
- During the reclamation phase of the project, all areas disturbed by construction would be reseeded with a BLM-approved seed mix.

Threatened and Endangered Species and Special Status Species:

- Ground clearing and other mine development activities would be avoided during breeding and nesting season (generally March 1 through August 31) until the area is surveyed by a qualified biologist to confirm the absence of nests (on the ground and in burrows and vegetation) and nesting activity to avoid impacting migratory birds.
- Active nests (containing eggs or young) would be avoided until they are no longer active or the young birds have fledged. The area to be avoided around the nest would be appropriate to the species, and the size of the avoided area would be confirmed by a BLM biologist.

Range and Livestock:

- The proposed mine area would be fenced to prevent injury or loss of livestock from mining operations. The location of the boundary fence would maintain connectivity for livestock movement throughout the Copper Flat Ranch allotment.
- Health and safety training of mine workers would include the provision of information on livestock open range and operation of vehicles to reduce the risk of collisions with livestock.

Noise and Vibrations:

- NMCC would coordinate with local authorities regarding the movement of oversized loads or heavy equipment.
- Proper hearing protection would be worn at all times.
- Primary crushing and crushed ore stockpile feeders would be located below grade where feasible.
- Below grade level rock crushing equipment and production facilities would be utilized.
- NMCC would notify nearby townships and residents who may experience blast noise.

CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

3.1 INTRODUCTION

3.1.1 Copper Flat EIS Significance Criteria

Similar projects and documentation were reviewed to ascertain the activities associated with mining that could potentially cause environmental impacts, and the types of impacts they could cause. Research was supplemented by professional judgment concerning impacts of typical concern for any large project.

Criteria were defined as a means of measuring the size of the impact and its significance. A structured framework is required to support conclusions concerning the significance of each of these effects and to systematically integrate individual resource assessments. For example, construction projects generally require some grading and soil disturbance. This disturbance of the soil could be important in and of itself, and it could also affect air quality (by creating fugitive dust), water quality (through erosion of the bare soil and sediment deposition in the surface water), terrestrial resources (through the removal of vegetation and wildlife habitat), and land resources (such as through the removal of prime agricultural soils).

The significance was determined systematically by assessing four parameters of environmental impact: magnitude (how much), extent (sphere of influence), duration, and likelihood of occurrence. Each parameter was divided into three levels as follows:

Magnitude:
- major
- moderate
- minor

Duration:
- long term
- medium term (intermittent)
- short term

Extent:
- large
- medium (localized)
- small (limited)

Likelihood:
- probable
- possible
- unlikely

For each type of impact identified, definitions of each of the terms were prepared. These are summarized for individual resources in Appendix A. The method of analysis for each impact was as quantitative as possible, given the amount of reliability of the data and the apparent importance of each issue. Given the definitions of magnitude, duration, extent, and likelihood for each type of impact, plus the assessments of the impact at each site, the significance of the impact at each site was determined by comparing the significance definitions to the predetermined definitions. The overall significance of the impact was then determined by referring to the guidelines shown below. (See Table 3-1.) For example, any impact that conformed to the definitions of major magnitude, medium extent, long-term duration, and probable likelihood was judged to be a significant impact. The following table lists the definitions of the parameter for each type of impact.

Table 3-1. Criteria for Rating Impacts

Table 3-1. Criteria for Rating Impacts				
Level of Impact				
Impact Rating	**Magnitude**	**Extent**	**Duration**	**Likelihood**
Significant	Major	Large or Medium	Any level	Probable
	Major	Large or Medium	Long-term	Possible
	Major	Any level	Medium-term, intermittent, or short-term	Possible
	Moderate	Large or Medium	Any level	Probable
	Major	Small	Any level	Probable
	Major	Small	Long-term	Possible
	Moderate	Large	Any level	Possible
	Moderate	Medium or Small	Any level	Possible
	Moderate	Small	Any level	Probable
	Major	Large	Any level	Unlikely
	Major	Medium or Small	Long-term	Unlikely
	Minor	Large	Any level	Probable
	Minor	Medium or Small	Long-term	Probable
	Major	Medium or Small	Medium-term, intermittent, or short-term	Unlikely
Not Significant	Minor	Medium	Medium-term or intermittent	Probable
	Minor	Large	Any level	Possible
	Minor	Medium or Small	Long-term	Possible
	Moderate to Minor	Any level	Any level	Unlikely
	Minor	Medium	Short-term	Probable
	Minor	Small	Medium-term, intermittent, or short-term	Probable
	Minor	Medium or Small	Medium-term, intermittent, or short-term	Possible

3.2 AIR QUALITY

3.2.1 Affected Environment

The U.S. Environmental Protection Agency (USEPA) Region 9 and the New Mexico Environment Department (NMED) regulate air quality in New Mexico. The Clean Air Act (42 United States Code (U.S.C.) 7401-7671q), as amended, gives USEPA the responsibility to establish the primary and secondary National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] Part 50) that set acceptable concentration levels for seven criteria pollutants: particulate matter (PM_{10}), fine particles ($PM_{2.5}$), sulfur dioxide (SO_2), carbon monoxide (CO), nitrous oxides (NO_x), ozone (O_3), and lead. Short-term standards (1-, 8-, and 24-hour periods) have been established for pollutants that contribute to acute health effects, while long-term standards (annual averages) have been established for pollutants that contribute to chronic health effects. Each State has the authority to adopt standards stricter than those established under the Federal program. In general, New Mexico accepts the Federal standards; however, the State does have slightly stricter standards for some pollutants such as SO_2, CO, and NO_2, as well as a standard for total suspended particulate (TSP).

3.2.1.1 Monitored Levels of Criteria Pollutants

The NMED monitors levels of criteria pollutants at representative sites in each region throughout New Mexico. The overall air quality in the vicinity of the mine is good. Until 2015, concentrations of criteria pollutants were monitored at the closest monitoring station in Grant County, approximately 20 miles west of the mine. (See Table 3-2.) Notably, the Grant County monitor was decommissioned in 2015 and there are no longer active NMED monitoring stations near the mine. New Mexico Copper Corporation (NMCC) operated an ambient particulate monitoring program consisting of two low-volume PM_{10} particulate samplers at the mine. Each sampler ran once every 6 days for a full 24-hour period from midnight to midnight. Both sites collected 58 samples between October 1, 2010 and September 30, 2011. The average 24-hour PM_{10} concentration for this period was 17.5 micrograms per cubic meter ($\mu g/m^3$), and the maximum 24-hour PM_{10} concentration was 68 $\mu g/m^3$. These levels are well below the PM_{10} NAAQS of 150 $\mu g/m^3$.

3.2.1.2 Attainment Status and National Air Toxics Assessment

Federal regulations designate Metropolitan Statistical Areas, counties, or partial counties within Air Quality Control Regions (AQCRs) in violation of the NAAQS as nonattainment areas. Federal regulations designate AQCRs with levels below the NAAQS as attainment areas. Sierra County and the Copper Flat mining project are in the El Paso-Las Cruces-Alamogordo Interstate AQCR (AQCR 153) (40 CFR 81.82). The USEPA has designated Sierra County as an attainment area for all criteria pollutants (USEPA 2014b). Because the project is in an attainment area, the air conformity regulations do not apply. In addition, the USEPA conducts a periodic National Air Toxics Assessment (NATA) that quantifies hazardous air pollutant emissions by county in the United States. The purpose of the NATA is to identify areas where hazardous air pollutant emissions result in high health risks and further emissions reduction strategies are necessary. A review of the results of recent NATA document shows that cancer, neurological, and respiratory risks in the mine area are well below national levels.

Table 3-2. NAAQS and Monitored Levels of Criteria Pollutants

Table 3-2. NAAQS and Monitored Levels of Criteria Pollutants

Pollutant	National Air Quality Standards	Monitored Data near Sierra County
CO		
1-hour[a] (ppm)	35	<no data>
8-hour[a] (ppm)	9	<no data>
NO_2		
1-hour (ppb)	100	<no data>
O_3		
8-hour[b] (ppm)	0.075	0.058
SO_2		
1-hour[a] (ppb)	75	1.0
3-hour[a] (ppm)	0.5	<no data>
$PM_{2.5}$		
24-hour[c] (μg/m^3)	35	<no data>
Annual arithmetic mean[d] (μg/m^3)	15	<no data>
PM_{10}		
24-Hour[a] (μg/m^3)	150	44.0

Source: USEPA 2014a.

Notes: ppm = parts per million, ppb = parts per billion, μg/m^3 = micrograms per cubic meter

Not to be exceeded more than once per year.

The 3-year average of the fourth highest daily maximum 8-hour average O_3 concentrations over each year must not exceed 0.075 ppm.

The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor must not exceed 35 μg/m^3.

The 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from must not exceed 15 μg/m^3.

Class I Areas: The Clean Air Act outlines different levels or classes of air quality protection. Generally, Class I areas are the most pristine, and any substantial emission sources in or near them have strict limits set by regulatory agencies. The USEPA provides rigorous safeguards to prevent deterioration of the air quality in Class I areas as specified in 40 CFR 81.421(e). The Prevention of Significant Deterioration (PSD) program designates USEPA Mandatory Class I areas as all international parks, all national wilderness areas, and national memorial parks that exceed 5,000 acres, and all national parks that exceed 6,000 acres in existence on August 7, 1977. There are several Class I areas within 250 miles of the mine. (See Table 3-3.)

Table 3-3. Class I Areas

Table 3-3. Class I Areas		
Area Name	**Acreage**	**Distance (Miles)**
Gila Wilderness Area	433,690	28
Salt Creek Wilderness Area	8,500	186
Carlsbad Caverns National Park	46,435	188
Bandelier Wilderness Area	23,267	205

Source: USEPA 2014c.

3.2.1.3 Overview of Permitting Requirements

The NMED implements programs for permitting the construction and operation of new or modified stationary sources of air emissions in New Mexico. Air permits are required for many industries and facilities in New Mexico that emit regulated pollutants. Based on the size of the emissions units and type of pollutants emitted (criteria pollutants or hazardous air pollutants), the NMED sets permit rules and standards for emissions sources. This section outlines the primary Federal and State permitting regulations. Emissions estimates and a discussion of how these regulations apply are included in Section 3.2.2, Environmental Effects.

The air quality permitting process begins with the application for a construction permit, and the mine would require various permits to construct. There are three types of construction permits available through the NMED for the construction and temporary operation of new emissions sources: PSD permits in attainment areas; major new source construction permits in nonattainment areas (Nonattainment New Source Review (NNSR)); and minor new source construction permits. Notably, mobile and off-road sources of air emissions do not require air permits. Thresholds that determine the type of construction permit that may be required depend on both the quantity and type of emissions.

Prevention of Significant Deterioration: The PSD regulations specify that major new stationary sources within an air quality attainment area must undergo PSD review. Sources that have the potential to emit greater than 250 tons per year (tpy) of a single criteria pollutant would be considered a “major source” and would be subject to the PSD review requirements (20.2.74 NMAC, adopted pursuant to 40 CFR 51.166 and 20.2.74 NMAC). Sources subject to PSD review are typically required to complete the following:

- Best Available Control Technology (BACT) review for regulated hazardous air pollutants and designated categories;
- Predictive air dispersion modeling;
- Establishing procedures for measuring and recording emissions and process rates;
- Meeting the New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements; and
- A public involvement process.

Nonattainment New Source Review: NNSR permits are required for any major new sources or major modifications to existing major sources in a nonattainment area. Because the mine is in an attainment area, the NNSR regulations do not apply.

Minor New Source Review: A minor source construction permit would be required to construct minor new sources, minor modifications of existing sources, and major sources not subject to NNSR or PSD permit requirements. A synthetic minor permit allows a facility to avoid major source requirements by accepting Federally-enforceable limits below the major source thresholds. The Minor New Source Review permit process also ensures that there would not be an exceedance of any NAAQS or New Mexico Ambient Air Quality Standards (NMAAQS). The Minor New Source Review permitting process typically takes 30 days for determination of completeness, then 90 days for the permit to be granted or denied (20.2.72.207 NMAC). Sources subject to Minor New Source Review could be required to complete the following:

- Maximum available control technology review (MACT) for regulated hazardous air pollutants and designated categories;
- Predictive air dispersion modeling as required by 20.2.72.203 NMAC; and
- Establish procedures for measuring and recording emissions and process rates.

Operating Permits: Under State and Federal operating permit regulations, a Title V permit is required for facilities whose emissions exceed the major source threshold (i.e., 100 tpy).

3.2.2 Environmental Effects

3.2.2.1 Proposed Action

Short- and medium-term minor adverse effects would be expected under the Proposed Action. Short-term effects would be limited to fugitive dust and heavy vehicle emissions during site preparation, while medium-term effects would be due to fugitive dust and heavy vehicle emissions during mine operation and reclamation. The Proposed Action would not exceed major source thresholds outlined in the PSD regulations, generate emissions that would exceed the NAAQS at any nearby location, or contribute to a violation of any State, Federal, or local air regulation.

3.2.2.1.1 Mine Development and Operation

Mine development activities that would affect air quality include soil stripping, blasting, and construction of the TSF and concentrator. In addition, heavy equipment exhaust emissions would be generated during construction and site preparation. Particulate emissions levels from development activities would vary, and impacts off-site would depend on the construction location and the daily wind and weather. While controls, such as road watering, would reduce the amount of emissions from construction and site preparation activities, some level of fugitive dust emissions would be unavoidable due to the nature of this activity. These activities may require an air quality permit from the NMED, which would require that watering or other measures be taken to limit fugitive dust emissions. Although some impacts would occur, they would be transitory, temporary, and controlled through best management practices (BMPs) required by the NMED. Air quality impacts would be short-term. The air quality permit issued by NMED would require controls that would ensure impacts would not exceed any NAAQS or NMAAQS.

Mine operational activities that may affect air quality, primarily from the generation of fugitive dust, include the use of haul roads, crushing activities, and materials storage and handling, such as wind erosion from stockpiles. In addition, some fugitive dust would be generated by land clearing, earth moving, scraping, truck loading, drilling, and blasting. Other pollutants emitted would include NO_x, CO, and SO_2 from exhaust emissions from heavy equipment, generators, personal vehicles, and other mobile equipment used on-site (i.e., small and medium trucks). The total direct and indirect emissions associated with the Proposed Action are outlined below. (See Table 3-4.) Because Sierra County is in attainment, no emissions inventory is required or available; however, it is expected that the emissions from the proposed facility would be a small fraction of the total county-wide emissions. A detailed breakdown of mine operational emissions is in Appendix B.

Table 3-4. Estimated Operational Emissions

Table 3-4. Estimated Operational Emissions							
Estimated Annual Emissions (tpy)							
Proposed Action – 17,500 tons per day	**NO_X**	**CO**	**SO_2**	**VOC**	**TSP**	**PM_{10}**	**$PM_{2.5}$**
Uncontrolled Facility Totals	28.8	113.6	3.4	<0.1	2,725.3	804.7	90.3
Allowable Facility Totals	28.8	113.6	3.4	<0.1	348.2	117.8	25.6
Alternative 1 - 25,000 tons per day							
Uncontrolled Facility Totals	54.4	214.4	6.4	<0.1	5,145.3	1,519.2	170.4
Allowable Facility Totals	54.4	214.4	6.4	<0.1	657.4	222.4	48.3
Alternative 2 - 30,000 tons per day							
Uncontrolled Facility Totals	65.3	257.3	7.7	<0.1	6,174.4	1,823.0	204.5
Allowable Facility Totals	65.3	257.3	7.7	<0.1	788.8	266.9	57.9

Source: NMED 2014.

Note: VOC = volatile organic compound.

General Conformity: The general conformity rules require Federal agencies to determine whether their action(s), or actions they approve or support, would increase emissions of criteria pollutants above preset threshold levels in nonattainment areas [40 CFR 93.153(b)]. Because the region is in attainment for all criteria pollutants, the general conformity rules do not apply.

Permitting and Regulatory Review: Permitting scenarios may vary based on the final design, timing of the project, and the types of controls ultimately selected. These may differ in specific features from the ones described in this EIS. During the final design stage and the permitting process, the actual equipment, controls, or operating limitations would be selected to reduce the potential to emit below the PSD major source threshold; or the PSD permitting process would ensure that the NAAQS were not exceeded and the emissions from the project would be included in the regional emissions inventory, ensuring that it would not interfere with the ability of the State to maintain the NAAQS. This system is inherent to Federal and State air regulations, and leads to a forced reduction in regional emissions in nonattainment areas or the preservation of clean air in attainment regions. Regardless of the ultimate permitting scenario, effects would be less than significant. The air quality permitting process would ensure that air impacts from the mine do not cause or contribute to violations of State or Federal standards.

Permitting requirements for proposed stationary sources are based on their overall potential to emit criteria pollutants. The project is designed to limit emissions below major source thresholds and PSD review is not required. The modeling performed for the air permit demonstrated compliance with all applicable ambient air quality standards. Controlled process emissions under the Proposed Action would be below the 250 tpy PSD permitting threshold; therefore, a minor source construction permit was applied for in February 2013, and the permit was issued in June of 2013 (NSR Permit No. 03655-M3). The permit emission limitations were based on the 25,000 tons per day (tpd) operating scenario (Alternative 1) and would cover all activities under the Proposed Action as well. Alternative 2 is not covered under the current construction permit, and would require a permit revision. While a PSD minor source, it would be required to submit a Title V application because the CO and PM_{10} emissions exceed 100 tpy. As a Title V major source, the facility would be required to submit an emissions inventory on an annual basis.

The mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico Administrative Code (NMAC) regulatory requirements and with compliant practices and products. These requirements include:

- Smoke and visible emissions (NMAC 20-2.61);

- Open burning (NMAC 20-2.60);
- Emissions from gas burning equipment (NMAC 20-2.33);
- Emissions from oil burning equipment (NMAC 20-2.18); and
- Non-coal mining operations (NMAC 19-10.5).

This listing is not all-inclusive; NMCC and any contractors would comply with all applicable New Mexico pollution control and mine safety regulations as they pertain to air quality.

Class I Areas: During the air permitting process, the PSD increment under the 25,000 tpd operating scenario (Alternative 1) was estimated for all pollutants at the nearest Class I areas. The nearest Class I area is Gila Wilderness Area, approximately 28 miles away. Both PSD Class I and II increment modeling was performed and no model results were above USEPA-proposed Significant Impact Levels. Emissions would rapidly decrease to background levels and have no effect on nearby Class I areas. It is expected that nearby concentrations under the Proposed Action would be lower than those developed for the accelerated operations under Alternatives 1 and 2. These effects would be less than significant.

Emission Controls and Best Management Practices: BMPs would be required and implemented for activities associated with the Proposed Action. Appropriate emission control equipment would be installed and operated in accordance with the air quality construction permit. Committed air quality and dust control BMPs for mine operations may include the following:

- Water would be applied on haul roads and other disturbed areas and other dust control measures would be used as per accepted and reasonable industry practice.
- Disturbed areas and stockpiles would be seeded with an interim seed mix to minimize fugitive dust emissions from unvegetated surfaces where appropriate.
- Crusher and conveyor drop points, and deposition of tailings would utilize spigotting or cyclone discharge. The surface would be wetted by implementing NMED and Mine Safety and Health Administration (MSHA)-approved Sonic Misting Systems, which are considered to be the Best Available Control Technology (BACT).
- The lime storage would be fitted with a baghouse for capture of fugitive dust during loading of the lime bin. The sample preparation lab would be equipped with fans and filters.
- Deposition of tailings would be wetted by spigotting or cyclone discharge. By this procedure, the surface would be wet, thereby eliminating or reducing fugitive dust. As necessary, control of fugitive dust in the vicinity of the tailings pond would be attained by watering, sprinkling, and vegetation.
- Drilling operations would be done wet or with other efficient dust control measures as set by the MSHA/the New Mexico State Mine Inspector's Office, and New Mexico mining and exploration permit requirements.
- Combustion emissions from mobile mining machinery and support vehicles would be controlled by manufacturer pollution control devices.

3.2.2.1.2 Mine Closure/Reclamation

Reclamation and revegetation would stabilize exposed soil and control fugitive dust emissions. As vegetation becomes established, particulate emission levels would return to what is typical for a dry, desert environment. Equipment use, vehicular traffic, and associated emissions would essentially cease following mine closure. Once reclamation was successfully completed, ambient pollutant concentrations would return to existing (i.e., pre-mining operation) levels.

3.2.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Short- and medium-term minor adverse effects would be expected under Alternative 1. The effects from mine development, operation, closure, and reclamation would be similar in nature, but at a somewhat greater level than those outlined under the Proposed Action. Short-term effects would be limited to fugitive dust and heavy vehicle emissions during site preparation, while medium-term effects would be due to fugitive dust and heavy vehicle emissions during mine operation and reclamation. Alternative 1 would not exceed major source thresholds outlined in the PSD regulations, generate emissions that would exceed the NAAQS or NMAAQS at any nearby location, or contribute to a violation of any State, Federal, or local air regulation.

The total direct and indirect emissions associated with Alternative 1 are outlined in Table 3-4. A detailed breakdown of emissions is in Appendix B. Controlled process emissions under Alternative 1 would be below the 250 tpy PSD permitting threshold; therefore, a minor source construction permit was applied for as mentioned in 3.2.2.1 with permit emission limitations based on the 25,000 tpd operating scenario of Alternative 1. During the air permitting process, the PSD increment was estimated for all pollutants at nearest Class I areas. Both PSD Class I and II increment modeling was performed and no model results were above USEPA-proposed Significant Impact Levels. These effects are anticipated to be less than significant.

As with the Proposed Action, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements, with compliant practices and products. These requirements, as well as all emission controls, and BMPs would be identical to those outlined under the Proposed Action. As with the Proposed Action, and for the same reasons, the general conformity rules do not apply.

3.2.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Short- and medium-term minor adverse effects would be expected under Alternative 2. The effects from mine development, operation, closure, and reclamation would be similar in nature and level as Alternative 1. Short-term effects would be limited to fugitive dust and heavy vehicle emissions during site preparation, while medium-term effects would be due to fugitive dust and heavy vehicle emissions during mine operation and reclamation. Alternative 2 would not likely exceed major source thresholds outlined in the PSD regulations, generate emissions that would exceed the NAAQS at any nearby location, or contribute to a violation of any State, Federal, or local air regulation. If Alternative 2 were ultimately selected, an air permit revision, including an updating dispersion modeling analysis, would be required.

The total direct and indirect emissions associated with Alternative 2 are outlined in Table 3-4. A detailed breakdown of emissions is in Appendix B. Except for CO and PM_{10}, controlled process emissions under Alternative 2 would be below the 250 tpy PSD permitting threshold. The potential to emit CO and PM_{10} would only be slightly higher than the major source threshold. It is expected that if Alternative 2 were ultimately selected, controls or permit limitations would be put in place to ensure that CO and PM_{10} emissions would remain below the threshold. The existing permit emissions limitations were based on the 25,000 tpd operating scenario and would not cover all activities under Alternative 2. A minor new source air permit modification would be required under Alternative 2. During the air permitting process, the PSD increment would be estimated from all pollutants at nearest Class I areas, and as with Alternative 1 it is not likely that model results would be above USEPA-proposed Significant Impact Levels. These effects would be less than significant. As with Alternative 1, NMCC would be required to submit a Title V application and annual emission statements because the CO and PM_{10} emissions exceed 100 tpy.

As with the Proposed Action and Alternative 1, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements, and with compliant practices and products. These requirements, as well as all emission controls, BMPs, and mitigation measures, are identical to those outlined under the Proposed Action. As with the Proposed Action, and for the same reasons, the general conformity rules do not apply.

3.2.2.4 No Action Alternative

The No Action Alternative would avoid the potential direct and indirect impacts of the Proposed Action to air resources.

3.2.3 Mitigation Measures

No mitigation measures for air resources beyond BMPs and regulatory requirements described in the Proposed Action have been identified for any alternative.

3.3 CLIMATE CHANGE AND SUSTAINABILITY

3.3.1 Affected Environment

This section describes the current climatic conditions of the mine area and the current state of knowledge regarding global climate change. The following paragraphs also discuss the responsibility of Federal agencies to meet Federal mandates and regulations related to climate change and sustainability.

3.3.1.1 Mine Area Climate

The mine area is located in an arid to semiarid climate regime typified by dry windy conditions and limited rainfall. Temperature data for the mine area show a wide daily and seasonal variability, which is typical of dry climates. The warmest temperatures occur in June and July and the coldest temperatures usually occur in December and January. In spring and fall, daily maximum temperatures are moderate, typically averaging 65 to 85 degrees Fahrenheit (°F). Nights are cooler, with low temperatures averaging 32 to 50°F. Summer maximum temperatures are generally in the 90s to low 100s (°F) and winter minimum temperatures are generally in the 20s or 30s. Temperatures have reached above 100°F in every month from May to September and have occasionally dipped below zero in December, January, and February. Daily temperature fluctuations of 30°F are common throughout the year (Intera 2012).

Table 3-5 shows climate normals for the 30-year period from 1981-2010 for Hillsboro, New Mexico, which is the closest observation site to the proposed mine area for which normals are available. The nearest New Mexico State University-monitored climate station is located approximately 5 miles to the southwest of the mine area (NMSU 2012).

Table 3-5. Climate Normals 1981-2010

Table 3-5. Climate Normals 1981-2010												
Hillsboro, New Mexico	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Average Temperature (°F)	40.2	44.1	50.0	57.2	65.5	73.4	76.0	73.8	67.9	58.2	47.2	39.5
Avg Max Temperature (°F)	55.2	59.9	66.4	74.4	83.1	91.3	91.2	88.2	83.5	74.5	63.1	54.2
Avg Min Temperature (°F)	25.3	28.2	33.5	39.9	47.8	55.5	60.7	59.4	52.3	41.8	31.2	24.7

Source: NOAA 2012.

Precipitation is divided between summer thunderstorms associated with the Southwest Monsoon and winter rain and snowfall as Pacific weather systems drop south into New Mexico. Precipitation at the mine area averages about 13 inches per year (ranging from nearly 3 inches in 1956 to over 20 inches in 1986). As much as half of the annual precipitation occurs in the form of intense thunderstorms during July, August, and September, when moist air enters the region from the Gulf of Mexico. Summer thunderstorms can result in heavy rainfall and flash floods. Average monthly precipitation in January through June is typically 0.50 inch or less. Snowfall is possible from October through April, but most likely (greater than 1 inch) between December through February (Intera 2012). Table 3-6 shows average precipitation for the 30-year period from 1981-2010 for Hillsboro, New Mexico.

Table 3-6. Average Precipitation 1981-2010

Table 3-6. Average Precipitation 1981-2010												
Hillsboro, New Mexico	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Average Precipitation (inches)	0.62	0.48	0.37	0.37	0.75	0.87	2.29	2.80	2.03	1.29	0.78	1.03

Source: NOAA 2012.

Evaporation exceeds precipitation in southwestern New Mexico. Pan evaporation data, the most commonly collected data, are correlated with lake evaporation (i.e., free water surface evaporation) to predict evaporation from reservoirs and lakes. Lake evaporation at the mine area is estimated to be approximately 58 to 65 inches per year, and pan evaporation is estimated to be approximately 80 to 90 inches per year (Intera 2012). (See Table 3-7.)

Table 3-7. Net Evaporation Summary - October 2010 through September 2011

Table 3-7. Net Evaporation Summary - October 2010 through September 2011		
Month	**Monthly Net Evaporation (inches)**	**Cumulative Net Evaporation (inches)**
October	3.959	3.959
November	1.152	5.111
December	***	***
January	***	***
February	***	***
March	***	***
April	9.562	14.673
May	11.146	25.819
June	14.249	40.069
July	10.339	50.407
August	5.938	56.345
September	6.181	62.526
Total		**62.526**

Note: Evaporation offline from 11/10/10 at 0900 through 04/02/2011 at 0700 for winter months.

3.3.1.2 Global Climate Change

Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. According to the United Nations (U.N.), climate change "refers to a change in the state of the climate that can be identified (e.g., using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or land use." Climate change research reports from the U.N. Intergovernmental Panel on Climate Change (IPCC), U.S. Climate Change Science Programs Science Synthesis and Assessment Products, and the U.S. Global Change Research Program conclude that the Earth's climate is changing, and this change is expected to accelerate (USDA 2009).

Some observed changes include shrinking of glaciers, thawing of permafrost, later freezing and earlier break-up of ice on rivers and lakes, lengthening of growing seasons, shifts in plant and animal ranges, and earlier flowering of trees (IPCC 2007).

Depending on where measurements are reported, some scientists believe global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies 2007). The IPCC (2007) and National Academy of Sciences (2006) indicated that by the year 2100, global average surface temperatures could increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels, but also indicated that there are uncertainties in the modeled results, especially regarding how climate change may affect different regions. Observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24° N) have exhibited temperature increases of 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970. Warming during the winter months is expected to be greater than during the summer months, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures.

Recent National Oceanic and Atmospheric Administration (NOAA) data shows that in the contiguous United States, March 2012 was warmer than any other March on record. March 2012 averaged fully 8.6°F warmer than the 20th century average for March in the United States. The NOAA's data also shows that the year's full first quarter – January, February, and March – was also the warmest ever recorded. While no individual weather pattern can be definitively attributed to human-induced climate change, or any other single cause, many scientists believe that the likelihood of unusually warm seasons is increasing as a result of emissions of heat-trapping gases generated by human activities. According to a recent study, high summer-season temperatures that used to occur in the United States only 5 percent of the time are now occuring at least 30 percent of the time throughout the lower 48 states (Fried 2012).

Average global temperature increases may be associated with human-induced increases in greenhouse gas (GHG) emissions released into the atmosphere as a result of combustion. GHGs, which include CO_2, methane (CH_4), nitrous oxide (NO_x), water vapor, and several trace gases, trap radiant heat reflected from the Earth, causing the average temperature to rise. The predominant GHGs emitted in the United States are CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. In the United States, anthropogenic GHG emissions come primarily from burning fossil fuels. Although GHG levels have varied for millennia (along with corresponding variations in climate conditions), recent more dramatic increases contribute to overall climate change, typically referred to as global warming. Increased CO_2 concentrations also lead to preferential fertilization of growth of specific plant species.

Energy-related CO_2 emissions from the combustion of petroleum, coal, and natural gas accounted for 81 percent of total United States anthropogenic GHG emissions in 2008. Anthropogenic CH_4 emissions from landfills, coal mines, oil and natural gas operations, and agriculture account for 11 percent of United States emissions. N_2O emitted through fertilizers, burning fossil fuels, and from industrial and waste management processes accounts for 4 percent of total emissions. Several human-made gases account for 3 percent of the GHG emissions total (DOE/EIA 2010).

In 2010, United States GHG emissions totaled 6,821.8 million metric tons CO_2. U.S. emissions rose by 3.2 percent from 2009 to 2010. This increase was primarily due to an increase in economic output resulting in an increase in energy consumption across all sectors and much warmer summer conditions resulting in an increase in electricity demand for air conditioning. Since 1990, U.S. GHG emissions have increased by 10.5 percent (USEPA 2012).

Concentrations of CO_2 in the atmosphere are naturally regulated by numerous processes collectively known as the carbon cycle. The movement of carbon between the atmosphere and the land and oceans is dominated by natural processes, such as plant photosynthesis. While these natural processes can absorb some of the more than 6 billion metric tons of anthropogenic CO_2 emissions produced each year (measured in carbon equivalent terms), over 3 billion metric tons is added to the atmosphere annually (EIA 2004). The Earth's positive imbalance between emissions and absorption results in the continuing growth in greenhouse gases in the atmosphere.

Responses to Global Warming: As GHGs have the potential to impact climate, in turn, climate has the potential to influence resource management. Some Federal agencies, states, and local communities address global warming by preparing GHG inventories and adopting policies that will result in a decrease of GHG emissions. Executive Order (EO) 13514, "Federal Leadership in Environmental, Energy, and Economic Performance" (October 5, 2009), outlines policies intended to ensure that Federal agencies evaluate climate change risks and vulnerabilities, and to manage the short- and long-term effects of climate change on their operations and mission. The EO specifically requires Federal agencies to measure, report, and reduce GHG emissions from both their direct and their indirect activities. Direct activities include actions or sources the agencies own and control, and the emissions of GHGs from their construction and operational activities. Indirect activities include actions of vendor supply chains, delivery services, and employee travel and commuting. In addition to the issuance of EO 13514, the EO's implementing instructions "Instructions for Implementing Climate Change Adaptation Planning in Accordance with Executive Order 13514" were also issued on March 4, 2011 (White House 2011).

The Council on Environmental Quality (CEQ) has issued draft guidance for considering global climate change in documents prepared pursuant to the National Environmental Policy Act (NEPA) (CEQ 2010; USDA 2009). The draft guidance identifies two aspects of global climate change:

- The potential for Federal agencies to influence global climatic change (e.g., increased emissions or sinks of greenhouse gases); and
- The potential for global climatic change to affect Federal actions (e.g., feasibility of coastal projects in light of projected sea level rise).

It is unlikely that global climate will change dramatically enough over the life of the project (approximately 16 years) to impact project activities. Section 3.3.2, Environmental Effects, evaluates the potential incremental cumulative impacts that emissions associated with the Proposed Action could contribute to global climatic change.

3.3.1.3 Sustainability

Sustainability and smart growth work to meet the needs of the present without compromising the ability of future generations to meet their own needs. To reduce environmental impacts and address limited resources, the BLM follows sustainability mandates related to several topics to promote sustainable planning, design, development, and operations. These topics are as follows:

- Guiding Principles for Federal Leadership in High Performance Sustainable Buildings;
- Use of recovered/recycled content and biobased products;
- Energy conservation;
- Renewable energy;
- Water conservation;
- Construction and demolition debris; and
- Sustainable operations and maintenance.

Project activities to which these topics pertain include the construction of new facilities at the project site and the proper use of all equipment related to construction, operation, and decommissioning. Project activities would be carried out in accordance with Federal, State, and local laws and regulations, as well as BMPs designed specifically with environmental protection, and thus sustainability, in mind.

3.3.1.4 Regulatory Requirements Related to Climate Change and Sustainability

According to EO 13148, "Greening the Government," all Federal agencies must take necessary actions to integrate environmental accountability into day-to-day decision making and long-term planning processes, across all agency missions, activities, and functions. Consequently, environmental management considerations must be a fundamental and integral component of all Federal agencies' policies, operations, planning, and management. The following Federal mandates and regulations shape the BLM's responsibilities related to climate change and sustainability:

- The Energy Independence and Security Act of 2007;
- The Energy Policy Act of 2005;
- EO 12873, "Federal Acquisition, Recycling, and Waste Prevention";
- EO 13031, "Federal Alternative Fuel Vehicle Leadership";
- EO 13134, "Development and Promotion of Biobased Products and Bioenergy";
- EO 13352. "Facilitation of Cooperative Conservation";
- EO 13423, "Strengthening Federal Environmental, Energy, and Transportation Management";
- EO 13514, "Federal Leadership in Environmental, Energy, and Economic Performance";
- The Federal Leadership in High Performance and Sustainable Building Memorandum of Understanding (MOU) 2006;
- Energy Independence and Security Act of 2007; and
- Pollution Prevention Act, 42 USC § 13101 *et seq.*

3.3.2 Environmental Effects

3.3.2.1 Proposed Action

Short- and medium-term minor adverse effects to climate would be expected under the Proposed Action. Short-term effects would be due to heavy vehicle emissions and the construction of facilities during site preparation, while medium-term effects would be due to heavy vehicle emissions and operation of facilities during mine operation and reclamation. The Proposed Action would not exceed major source thresholds outlined in the PSD regulations, generate emissions that would exceed the NAAQS at any nearby location, or contribute to a violation of any Federal, State, or local regulation associated with emissions, climate, or sustainability.

3.3.2.1.1 Mine Development and Operation

Mine development activities that would affect air quality include the use of heavy equipment that creates exhaust emissions during construction and site preparation and the construction of facilities at the site. Particulate emissions levels from development activities would vary, and impacts off-site would depend on the construction location and the daily wind and weather. Although some impacts would occur, they would be transitory, temporary, and controlled through BMPs described in Section 3.2, Air Quality. These effects would be less than significant.

Mine operational activities would cause the emission of pollutants such as NO_x, CO, and SO_2 from the operation of facilities and exhaust emissions from heavy equipment, generators, personal vehicles, and other mobile equipment used on-site (i.e., small and medium trucks). The total direct and indirect emissions associated with the Proposed Action are outlined in Section 3.2, Air Quality. A detailed breakdown of mine operational emissions is in Appendix B.

Construction of facilities at the site would have negligible and adverse impacts to climate due to building emissions related to energy use. Impacts to sustainability would be negligible to minor and adverse due to the consumption of materials, water, and energy at the facilities, reduction of impervious surface, and the generation of solid waste.

Permitting and Regulatory Review: Permitting scenarios may vary based on the final design, timing of the project, and the types of controls ultimately selected. These may differ in specific features from the ones described in this EIS. During the final design stage and the permitting process, the actual equipment, controls, or operating limitations would be selected to reduce the potential to emit below the major source threshold. Therefore, regardless of the ultimate permitting scenario, effects would be less than significant.

Permitting requirements for proposed stationary sources are based on their overall potential to emit criteria pollutants. The project is designed to limit emissions below major source thresholds (i.e., to be permitted as a synthetic minor source) and PSD review is not required. Controlled process emissions under the Proposed Action would be below the 250 tpy PSD permitting threshold; therefore, a minor or synthetic minor operating permit was applied for in February 2013, and the permit was issued in June of 2013. The permit emission limitations were based on the 25,000 tpd operating scenario (Alternative 1) and would cover all activities under the Proposed Action as well.

BMPs, as described in Section 3.2, Air Quality, would be required and implemented for activities associated with the Proposed Action.

3.3.2.1.2 Mine Closure/Reclamation

Equipment use, vehicular traffic, facility operation, and associated emissions would essentially cease following mine closure. Once reclamation was successfully completed, ambient pollutant concentrations would return to existing (i.e., pre-mining operation) levels.

Impacts to climate change from the Proposed Action would be minor, short- and medium-term, of small extent, and would occur with probable likelihood. Impacts under the Proposed Action would not be significant.

3.3.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Short- and medium-term minor adverse effects would be expected under Alternative 1. The effects from mine development, operation, closure, and reclamation would be similar in nature, but at a somewhat greater level than those outlined under the Proposed Action. Alternative 1 would not exceed major source thresholds outlined in the PSD regulations, generate emissions that would exceed the NAAQS at any nearby location, or contribute to a violation of any State, Federal, or local regulation related to air emissions, climate, or sustainability.

The total direct and indirect emissions associated with Alternative 1 are outlined in Table 3-4, and a detailed breakdown of emissions is in Appendix B. Effects would be less than significant.

As with the Proposed Action, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements, with compliant practices and products. These requirements, as well as all emission controls, and BMPs would be identical to those outlined under the Proposed Action.

Impacts to climate change from Alternative 1 would be minor, short- and medium-term, of small extent, and would occur with probable likelihood. Impacts would not be significant.

3.3.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Short- and medium-term minor adverse effects would be expected under Alternative 2. The effects from mine development, operation, closure, and reclamation would be similar in nature and level as Alternative 1. Alternative 2 would not likely exceed major source thresholds outlined in the PSD regulations, generate emissions that would exceed the NAAQS at any nearby location, or contribute to a violation of any State, Federal, or local air, climate, or other regulation related to sustainability.

The total direct and indirect emissions associated with Alternative 2 are outlined in Table 3-4, and a detailed breakdown of emissions is in Appendix B. Except for CO, controlled process emissions under Alternative 2 would be below the 250 tpy PSD permitting threshold. The potential to emit CO would only be slightly higher than the major source threshold. It is expected that if Alternative 2 were ultimately selected, controls or permit limitations would ensure that CO emissions impacting climate would remain below the threshold. These effects would be less than significant.

As with the Proposed Action and Alternative 1, mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements, with compliant practices and products. These requirements, as well as all emission controls, BMPs, and mitigation measures are identical to those outlined under the Proposed Action.

Impacts to climate change from the Proposed Action would be minor, short- and medium-term, of small extent, and would occur with probable likelihood. Impacts would not be significant.

3.3.2.4 No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action to climate and sustainability.

3.3.3 Mitigation Measures

No mitigation measures for climate change and sustainability beyond regulatory requirements described in the Proposed Action have been identified for any alternative.

3.4 WATER QUALITY

3.4.1 Affected Environment

Mining at the Copper Flat deposit has occurred intermittently over the last century, and previous mining activities have affected water quality. The most extensive previous mining activities at Copper Flat occurred in the early 1980s when Quintana Minerals operated a mine at this location. Quintana Minerals constructed a mineral processing facility, tailings storage facility (TSF), waste rock areas, and an open pit during a brief period of operation. Quintana's mining activities ceased in 1982 as a result of low metals prices after only 3 months of production. The mine was placed in temporary cessation for several years and was reclaimed in 1986.

Mining-related environmental laws have become more stringent in the past several decades; mine water quality management practices that are currently commonplace were not well-developed in the early 1980s when Quintana operated the mine. Previous mining practices during this period of lax mining regulation caused adverse effects to both groundwater and surface water quality in the Copper Flat mine area.

Characterization of the water quality affected environment is pertinent for several reasons. It defines the baseline water quality in the mine area, which could be affected either beneficially or adversely by the Proposed Action or alternatives. It also provides insight into the natural geochemical characteristics of the ore body and the various mechanisms that may release contaminants into the environment.

3.4.1.1 Boundary of Analysis Area

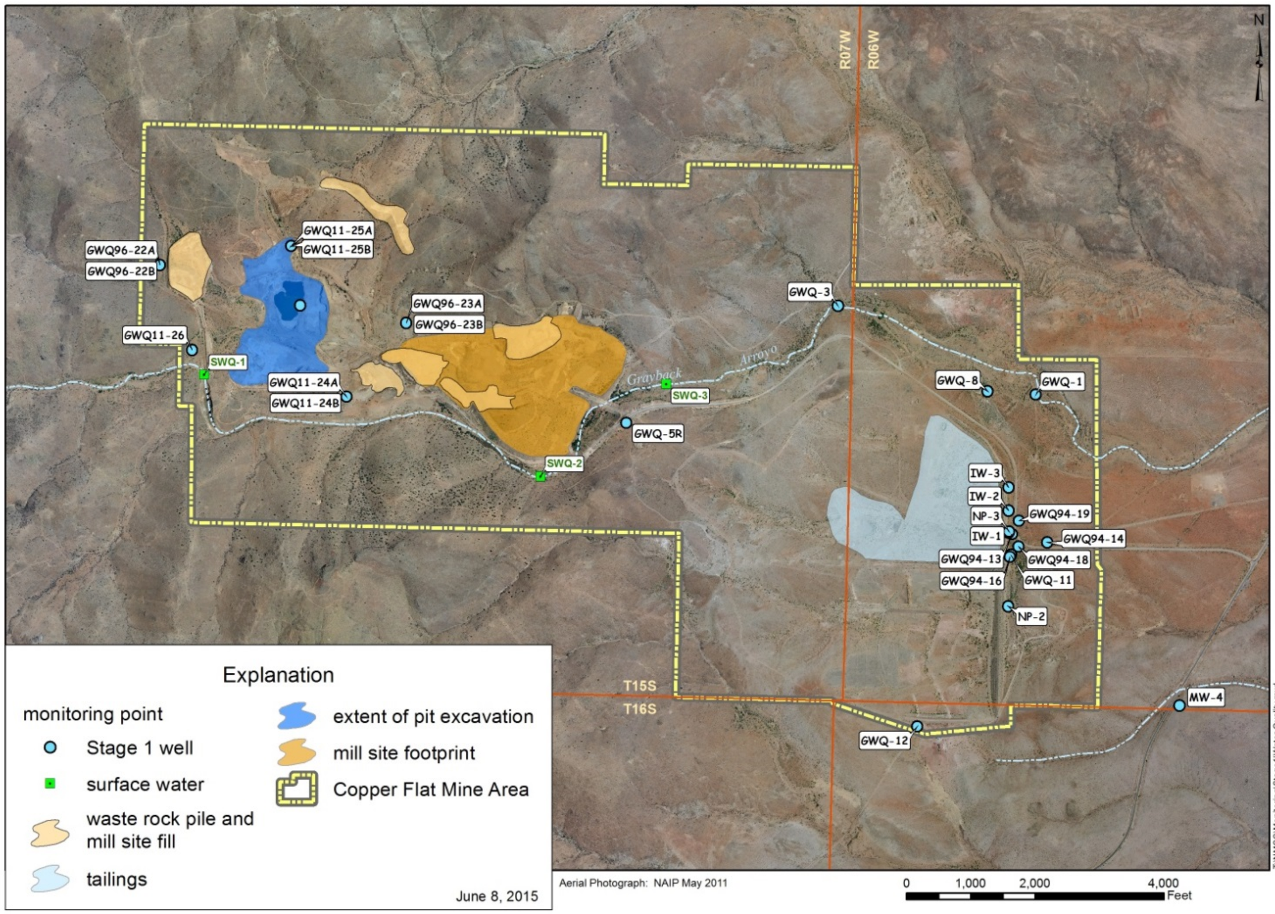
The geographic boundary of the analysis and the relevant media (i.e., surface water and groundwater) were determined based on analysis of the water quality issues identified during scoping. Potential effects to water quality would occur within the primary mine disturbance area, which includes the mine pit, waste rock storage areas, the mineral processing facility, and the TSF. (See Figure 3-1.) Therefore, the following analysis focuses on this area.

The primary mine disturbance area encompasses portions of the land listed in the legal description below.

New Mexico Principal Meridian, New Mexico
T. 15 S., R. 6 W.,
secs. 30 and 31.
T. 16 S., R. 6 W.
sec. 6.
T. 15 S., R. 7 W.,
secs. 25, 26, 27, 35, and 36.

The analysis area is entirely within the Greenhorn Arroyo watershed. The proposed mining-related disturbance would occur within the Greyback Arroyo watershed, which is a tributary within the Greenhorn Arroyo watershed.

Figure 3-1. Location of Selected Baseline Surface Water and Groundwater Sampling Sites



Source: JSAI 2013a.

3.4.1.2 Potentially Affected Media and Indicators

The media that will be assessed in this section and the corresponding effects analysis are defined as follows:

- Surface water includes the pit lake and ephemeral streams within the geographic boundary of the effects analysis.
- Groundwater includes water located beneath the surface of the primary mine disturbance area within the zone of saturation.

Although the water supply wells are located outside of the primary mine disturbance area, effects to water quality are not anticipated to be caused by pumping of water from the supply wells. Therefore, the area of the supply wells is not included within the geographic bounds of the water quality effects analysis.

The measurement indicator for surface water and groundwater quality was defined based on comparison of existing water quality and expected future water quality analysis with applicable water quality standards set forth by the State of New Mexico. This measurement indicator is the number of water quality parameters that exceeded applicable standards during the baseline monitoring period or that are expected to exceed applicable standards in the future.

For example, if surface or groundwater quality exceeds the applicable State water quality standard for cadmium and copper, but meets other applicable water quality standards, a measurement indicator of 2 would be applied. If the water quality meets all applicable water quality standards, a measurement indicator of zero would be applied. Accordingly, a lower value of the measurement indicator indicates water with relatively better water quality, whereas a higher value of the measurement indicator indicates water with relatively lower water quality. This approach to defining water quality measurement indicators will be applied in the following sections, which define the water quality characteristics of the affected environment and assess the potential effects to water quality of the Proposed Action and the alternatives.

3.4.1.3 Description of Affected Environment

Adverse water quality effects have been observed previously in four locations within the primary mine disturbance area:

- Surface water in the pit lake;
- Surface water in Greyback Arroyo;
- Groundwater in the vicinity of the existing pit; and
- Groundwater in the former mineral processing and TSF areas.

Additional information regarding the existing condition of surface water and groundwater quality in a larger region surrounding the Copper Flat mine is provided in previous reports, including the Baseline Data Characterization Report for Copper Flat Mine, Sierra County, New Mexico (Intera 2012); Copper Flat Mine Plan of Operations (MPO) (NMCC 2012); and Conceptual Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico (JSAI 2012).

Surface Water in the Pit Lake: A lake is present year-round in the existing open pit, which was constructed by Quintana Minerals in the early 1980s. This feature is called a pit lake in commonly used mining terminology. Pit lakes are an important water quality concern at numerous metal mines in the United States (NRC 1999; Castedenyk and Eary 2009; Shevenell et al. 1999).

The existing pit lake has a surface area of approximately 5 acres and a maximum depth of approximately 35 feet. The pit lake contains approximately 60 acre-feet (AF) of water (20 million gallons). The water level in the pit lake varies seasonally, and generally ranges from approximately 5,435 to 5,450 feet above mean sea level (amsl), with a corresponding range in surface area of 5 to 14 acres (JSAI 2013). Pit lake water levels are generally highest in the winter and are relatively lower in the summer (Intera 2012).

The presence of a perennial lake in the semi-arid climate present at the Copper Flat mine suggests that the pit lake is in hydrologic communication with groundwater, and that inflows of groundwater into the pit lake provides a source of water to the lake. Inflows of water to the pit lake include discharges of groundwater from the crystalline bedrock aquifer and periodic inflows of stormwater runoff. The outflows are primarily due to evaporation, because the pit lake does not discharge to surface water.

Five groundwater monitoring wells are present in the area of the pit lake. The general direction of groundwater flow can be estimated by evaluating the water level in the monitoring wells in relation to the elevation of the water surface in the pit lake. Measurements of monitoring well water levels presented in the baseline design report (Intera 2012) show that groundwater was flowing into the pit lake in fall of 2011. In general, it is thought that groundwater flows into the pit lake throughout the year and is subsequently evaporated, creating an evaporative sink or “terminal lake”. This conclusion is supported by the evaluation of evaporation versus precipitation in the area and results of groundwater modeling (JSAI 2012).

Pit lake water quality in New Mexico is subject to the requirements of the Federal Clean Water Act as amended and associated State surface water quality standards. The Clean Water Act requires establishment of use designations for surface water bodies and water quality standards that are applicable to the designated uses. This facet of the Clean Water Act is administered by the State of New Mexico. The surface water quality standards and use designations are adopted by the New Mexico Water Quality Control Commission and are then approved by the USEPA. The surface water quality standards are reviewed, and revised if necessary, every 3 years in the triennial review.

The Clean Water Act requires States to classify surface water with respect to the designated uses for that water. The use designations of the Copper Flat pit lake are set forth in NMAC 20.6.4.99 as warmwater aquatic life, livestock watering, wildlife habitat, and primary contact, and the most stringent of the standards defined for these designated uses applies to the surface water body. Primary contact water quality standards relate to E. coli bacteria, which are not likely to be associated with the existing or proposed mining disturbance. Therefore, primary contact water quality standards are not addressed in this section.

Pertinent surface water quality standards applicable to the pit lake are summarized below. (See Table 3-8.)

The existing water quality in the pit lake exceeded applicable surface water quality standards for aluminum, cadmium, copper, lead, manganese, selenium, and zinc in at least one of the baseline water quality samples collected during 2011 through 2012. The pit lake water quality exceeded surface water quality standards for cadmium, copper, manganese, and selenium during all baseline surface water sampling events. Based on this data, the existing pit lake does not meet the water quality standards for the designated uses of warmwater aquatic life, livestock watering, or wildlife habitat. Based on existing conditions, the water quality measurement indicator for surface water quality within the pit lake is 4, based on the number of surface water quality parameters that consistently exceeded applicable surface water quality standards during baseline sampling.

Table 3-8. Surface Water Quality Standards Applicable to Pit Lake for Selected Analytes

Table 3-8. Surface Water Quality Standards Applicable to Pit Lake for Selected Analytes

Water Quality Parameter	Use Designation		
	Warmwater Aquatic Life	Livestock Watering	Wildlife Habitat
pH	6.6 to 9.0 su	NA	NA
Arsenic	150/340 µg/L	200 µg/L	NA
Aluminum	4,035/10,071 µg/L (total recoverable)	NA	NA
Cadmium	1.22/5.38 µg/L	50	NA
Chromium	NA	1,000 µg/L	NA
Copper	29/50 µg/L	500 µg/L	NA
Lead	11/280 µg/L	100 µg/L	NA
Manganese	2,618/4,738 µg/L	NA	NA
Mercury		10 µg/L	0.77 µg/L
Molybdenum	1,895/7,920 µg/L (total recoverable)	NA	NA
Nickel	170/1,510 µg/L	NA	NA
Nitrate/Nitrite	132 mg/L	NA	NA
Selenium	5/20 µg/L	NA	5 µg/L
Silver	35 µg/L (acute)	NA	NA
Zinc	428/564 µg/L	NA	NA
Vanadium	NA	100 µg/L	NA
Radium 226 + Radium 228	NA	30 pCi/L	NA

Source: NMAC 20.6.4.

Notes: Chronic and acute standards shown where applicable (e.g., 150/340).

Hardness dependent standards assume a hardness of 400 mg $CaCO_3$ per liter.

Units: µg/L = microgram per liter, mg/L = milligram per liter, pCi/L = picocurie per liter.

The pit lake water contained high total dissolved solids (TDS), which ranged from 7,770 to 9,680 milligrams per liter (mg/L) in samples collected during 2010 and 2011. The TDS concentration in the pit lake water increased from approximately 3,500 mg/L to 9,500 mg/L during the period of 1989 to 2011 based on available data. The concentrations of cadmium, copper, manganese, selenium, and sulfate also increased over the period of 1989 to 2011 based on the available data. This increasing trend in TDS is caused, in part, by concentration through evaporation, which removes water from the pit lake but does not remove TDS. Periodic dissolution and flushing of products of mineral oxidation from the highwalls surrounding the pit lake also affect pit lake water quality.

Post-closure pit lake water quality is also regulated by 20.6.7 NMAC, Groundwater Protection – Supplemental Permitting Requirements for Copper Mine Facilities. NMAC 20.6.7.33(D) requires that pit lakes in which evaporation from the surface of the open pit water body is expected to exceed the water inflow shall be considered hydrologic evaporative sinks and water quality in these pit lakes is not subject to New Mexico groundwater quality standards at 20.6.2.3103 NMAC. If water is predicted to flow from a pit lake into groundwater, the groundwater quality standards at 20.6.2.3103 would apply to the pit lake. Based on the current conceptual understanding of the groundwater flow system at the pit lake, it is thought that the groundwater quality standards at 20.6.2.3103 NMAC do not apply to the existing pit lake.

Surface Water in Greyback Arroyo: The pit lake, waste rock disposal facilities (WRDFs), former mineral processing area, and TSF are located within the Greyback Arroyo watershed. Surface water is ephemeral within the Greyback Arroyo in the vicinity of the primary mine disturbance area.

Surface water quality in the Greyback Arroyo watershed has been historically monitored at three surface water quality stations: SWQ-1, SWQ-2 and SWQ-3. (See Figure 3-1.) Sampling site SWQ-1 is located upstream of the mining and minerals processing area (MMPA), sampling site SWQ-2 is located adjacent to and south of the MMPA, and sampling site SWQ-3 is located downstream of the MMPA. The historical sampling sites were also monitored during the baseline sampling program conducted during 2010 through 2011.

Surface water was present infrequently at the baseline sampling sites within the Greyback Arroyo as described below:

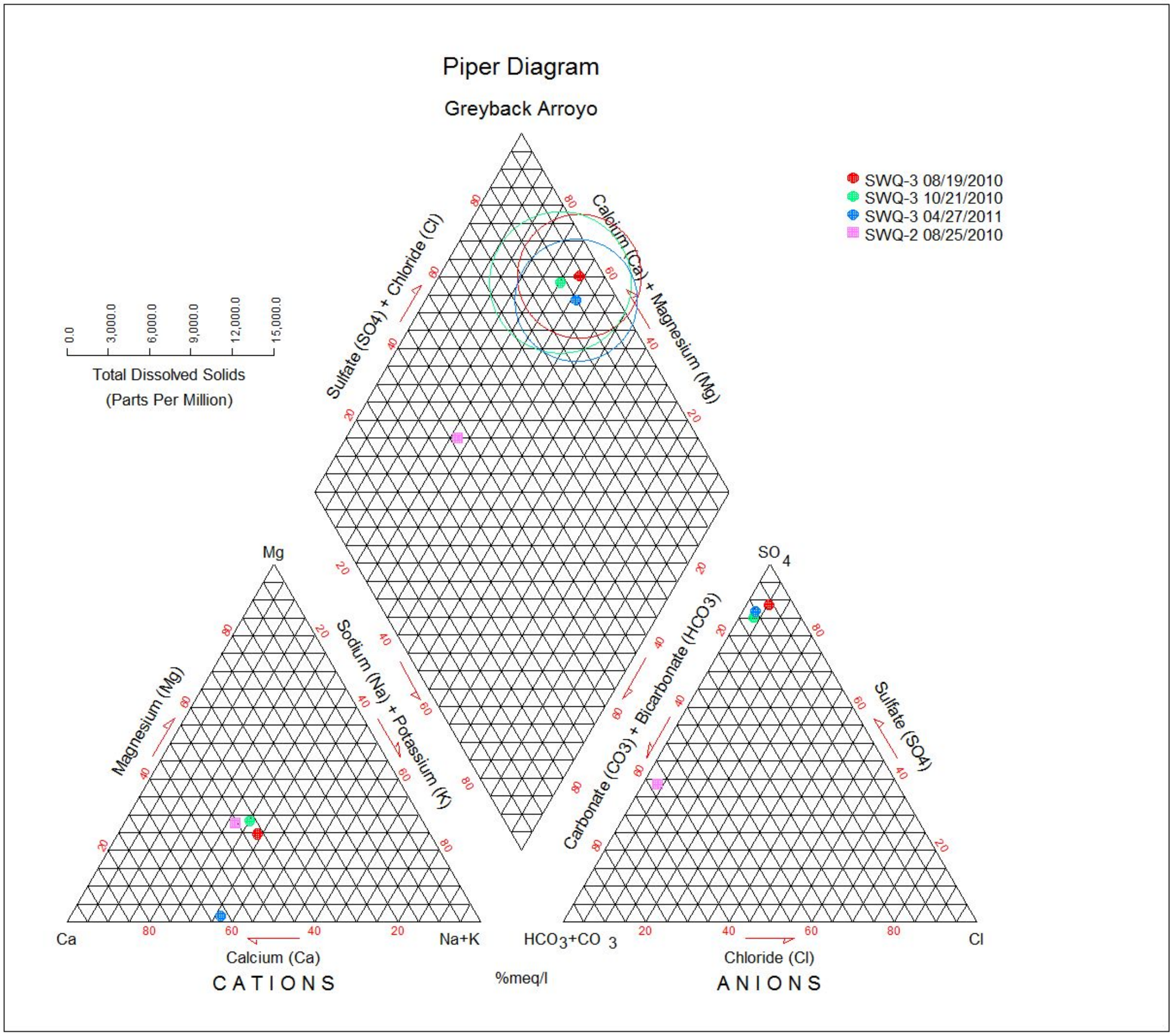
- SWQ-1 was dry during all baseline sampling events.
- Pooled water was present at SWQ-2 during two of the four sampling events, but surface water flow was not measurable.
- Pooled water was present at SWQ-3 during three of the four sampling events, but the flow was not measurable.

Effects to water quality caused by natural weathering and mining of ore bodies containing sulfide minerals can be evaluated through analysis of the water chemistry. In general, many natural surface waters are characterized as calcium-bicarbonate waters with low concentrations of TDS. Sodium may also be present as the major cation depending on the natural geology of the area; these waters are termed sodium-bicarbonate waters. TDS is a measure of the total amount of dissolved substances in the water. Water quality effects associated with mining of sulfide ore bodies can lead to development of acidic water and increases in TDS, which are caused by oxidation of sulfide minerals and dissolution of the products of sulfide oxidation into the water. Water quality effects associated with mining of sulfide ore bodies can also be identified by examining concentrations of major ions in the water. For example, oxidation of sulfide minerals and subsequent dissolution of the products of sulfide mineral oxidation can increase the relative contribution of sulfate in the water, and sulfate can replace bicarbonate as the major anion in the water. Natural weathering of sulfide ore bodies can also produce similar major ion signatures, so the presence of high TDS calcium-sulfate type water does not independently prove that waters are mining-influenced.

Surface water quality data collected from the Greyback Arroyo during the baseline sampling events were evaluated by using Piper diagram analysis to identify major ion signatures, which may indicate waters affected by natural weathering or mining of the Copper Flat ore deposit. A Piper diagram is a graphical method to evaluate the dominant cations (positively charged ions) and anions (negatively charged ions) in the water. The TDS is also shown on the Piper diagram as a circle surrounding the water quality data point, with the diameter of the circle scaled in a relative manner to the TDS concentration.

Piper diagram analyses for surface water sites in Greyback Arroyo show that surface water present at site SWQ-2 in August 2010 was calcium-bicarbonate type water with relatively low TDS. (See Figure 3-2.) This water does not show effects of natural weathering or mining of the Copper Flat ore deposit. In contrast, Piper diagram analysis of samples collected from site SWQ-3 in August 2010, October 2010, and April 2011 show that water at that location is calcium-sulfate type water with relatively higher TDS concentrations. The data from site SWQ-3 suggest that surface water in that portion of Greyback Arroyo is affected by natural weathering of the Copper Flat ore body and previous mining of the ore body. It is likely that the observed major ion chemistry is a result of a combination of both natural and anthropogenic causes.

Figure 3-2. Piper Diagram of Baseline Surface Water Samples Collected in Greyback Arroyo



Source: CDM Smith 2014

Note: Surface water in ephemeral streams in New Mexico is classified with the following use designations:
- Limited aquatic life;
- Livestock watering;
- Wildlife habitat; and
- Secondary contact.

Surface water quality standards apply to ephemeral surface water within Greyback Arroyo. (See Table 3-9.) Secondary contact water quality standards relate to E. coli bacteria, which are not likely to be associated with the existing or proposed mining disturbance. Therefore, secondary contact water quality standards are not addressed in this section.

Table 3-9. Surface Water Quality Standards Applicable to Ephemeral Surface Water in Greyback Arroyo for Selected Analytes

Water Quality Parameter	Use Designation		
	Limited Aquatic Life	Livestock Watering	Wildlife Habitat
pH	6.6 to 9.0 su	NA	NA
Arsenic	340 µg/L	200	NA
Aluminum[1]	10,071 µg/L (total recoverable)	NA	NA
Cadmium[1]	5.38 µg/L	50	NA
Chromium[1]	NA	1,000 µg/L	NA
Copper[1]	50 µg/L	500 µg/L	NA
Lead[1]	280 µg/L	100 µg/L	NA
Manganese[1]	4,738 µg/L	NA	NA
Mercury		10 µg/L	0.77 µg/L
Molybdenum	7,920 µg/L (total recoverable)	NA	NA
Nickel[1]	1,510 µg/L	NA	NA
Nitrate/Nitrite	132 mg/L	NA	NA
Selenium	20 µg/L	NA	5 µg/L
Silver[2]	35 µg/L	NA	NA
Zinc[2]	564 µg/L	NA	NA
Vanadium	NA	100 µg/L	NA
Radium 226 + Radium 228	NA	30 pCi/L	NA

Source: NMAC 20.6.4.

Notes: Aquatic life standards are acute standards assuming a hardness of 400 mg/L calcium carbonate equivalent.
Hardness dependent standards assume a hardness of 400 mg $CaCO_3$ per liter.
Units: µg/L = microgram per liter, mg/L = milligram per liter, pCi/L = picocurie per liter.

Based on the available baseline data collected during 2010 and 2011, surface water quality in Greyback Arroyo met applicable standards with the exception of copper (80 mg/L), which slightly exceeded the standard during one of the three sampling events. (See Table 3-9.) It is unknown if this is a result of natural weathering of the ore body or previous mining activities. Therefore, the water quality measurement indicator for the existing condition ranges from 0 to 1. (See Appendix C and D for relevant water quality data.)

Groundwater Quality in the Vicinity of the Existing Pit: Groundwater quality in the vicinity of the existing pit is variable, with groundwater at some monitoring wells showing likely effects of previous mining. Pertinent water quality standards for groundwater are shown below. (See Table 3-10.)

Table 3-10. Groundwater Quality Standards for Selected Analytes

Table 3-10. Groundwater Quality Standards for Selected Analytes	
Water Quality Parameter	**Standard**
pH[2]	6 to 9 su
TDS[2]	1,000 mg/L
Sulfate[2]	600 mg/L
Fluoride[1]	1.6 mg/L
Aluminum[3]	5 mg/L
Cadmium[1]	0.01 mg/L
Cobalt[3]	0.05 mg/L
Copper[2]	1 mg/L
Manganese[2]	0.2 mg/L
Selenium[1]	0.05 mg/L
Zinc[2]	10 mg/L

Source: NMAC 20.6.2.

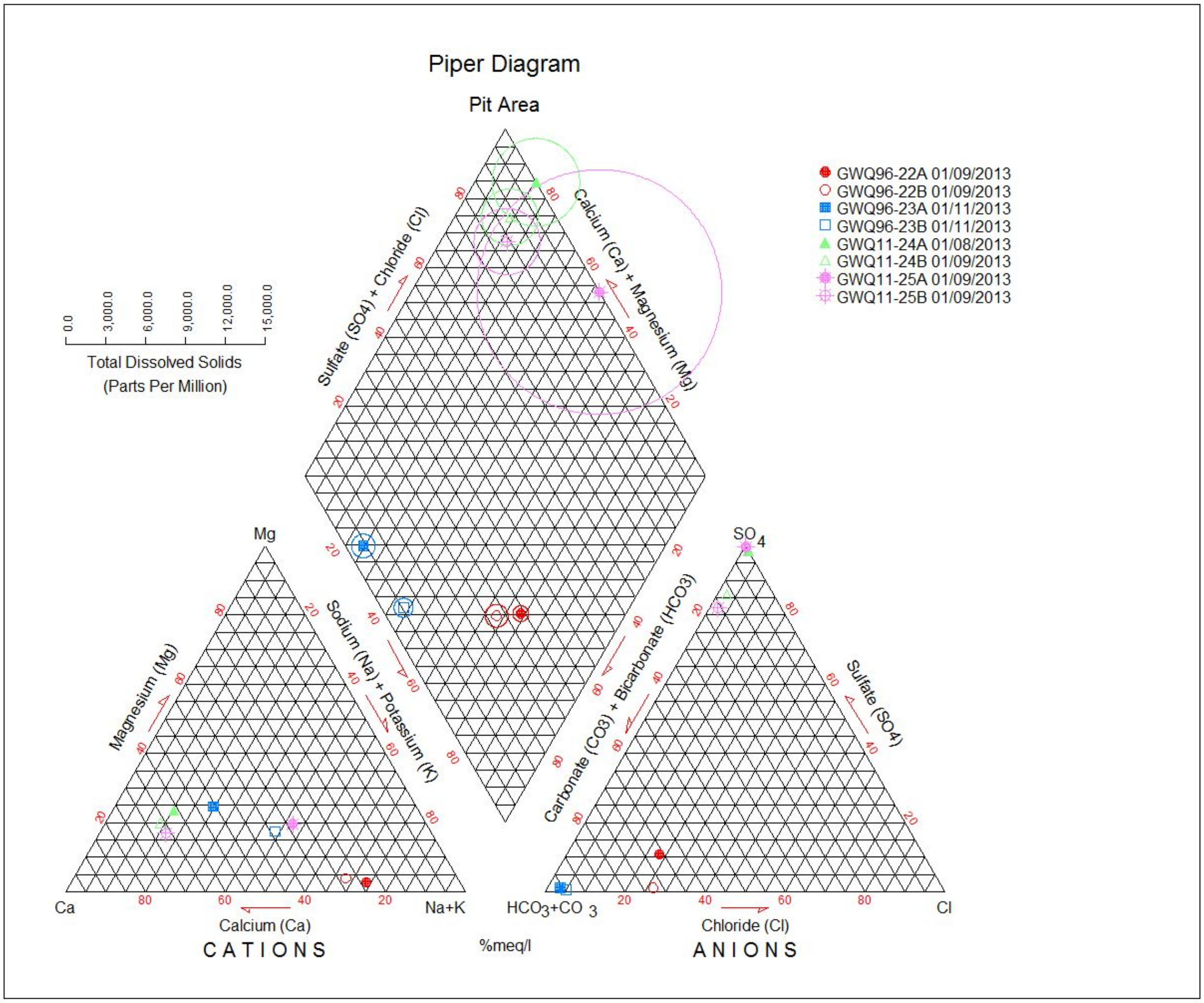
Notes: 1. Human Health Standards (NMAC 20.6.2.3103 A).
2. Other Standards for Domestic Water Supply (NMAC 20.6.2.3103 B).
3. Standards for Irrigation Use (NMAC 20.6.2.3103 C).

Units: mg/L = milligram per liter, su = standard units.

During 2013, groundwater samples were collected from four wells in the vicinity of the mine pit. (See Figure 3-1.) Water quality in these wells was monitored in 2013 as part of the Stage 1 Abatement Plan. Detailed information regarding this sampling is included in Status Report for Stage 1 Abatement at the Copper Flat mine area near Hillsboro, New Mexico (JSAI 2013a). Summary information focused on assessment of major ion ratios and measurement indicators is presented in the following paragraphs. Piper diagram analyses for these monitoring wells are shown below. (See Figure 3-3.)

Monitoring wells GWQ96-22a and GWQ96-22b are collocated west and upgradient from the mine pit. Groundwater at this location is sodium-bicarbonate water with relatively low TDS concentrations compared to other wells in the pit area. In the 2013 samples, water at GWQ96-22a and GWQ96-22b exceeded the New Mexico groundwater quality standards for fluoride [3.07 mg/L and 3.32 mg/L] only. Based on the sodium-bicarbonate major anion signature, relatively low TDS and upgradient location with respect to the mine pit, the elevated fluoride concentrations are considered a result of natural conditions. The measurement indicator at monitoring wells GWQ96-22a and GWQ96-22b is 1 (i.e., fluoride).

Figure 3-3. Piper Diagram of Baseline Groundwater Samples Collected in Area of the Existing Pit



Source: CDM Smith 2014.

Monitoring wells GWQ96-23a and GWQ96-23b are collocated east and downgradient of the mine pit. These wells exhibit a sodium/calcium-bicarbonate signature with relatively low TDS. During the 2013 sampling programs (JSAI 2013), water quality at GWQ96-23a and GWQ96-23b exceeded New Mexico groundwater quality standards for fluoride [2.0 mg/L and 2.05 mg/L] only, which is similar to the upgradient water quality at GWQ96-22a and GWQ96-22b. Based on the presence of bicarbonate as the dominant anion, the relatively low TDS and similar fluoride concentrations to upgradient groundwater, it is reasonable to conclude that groundwater quality at GWQ96-23a and GWQ96-23b is not affected by previous mining. The measurement indicator at monitoring wells GWQ96-23a and GWQ96-23b is also 1 (i.e., fluoride).

Monitoring wells GWQ11-24a and GWQ11-24b are collocated on the southeast side of the mine pit. In contrast to water quality at the previously discussed monitoring wells, the water at GWQ11-24a and GWQ11-24b is calcium-sulfate water, which contains relatively higher concentrations of TDS.

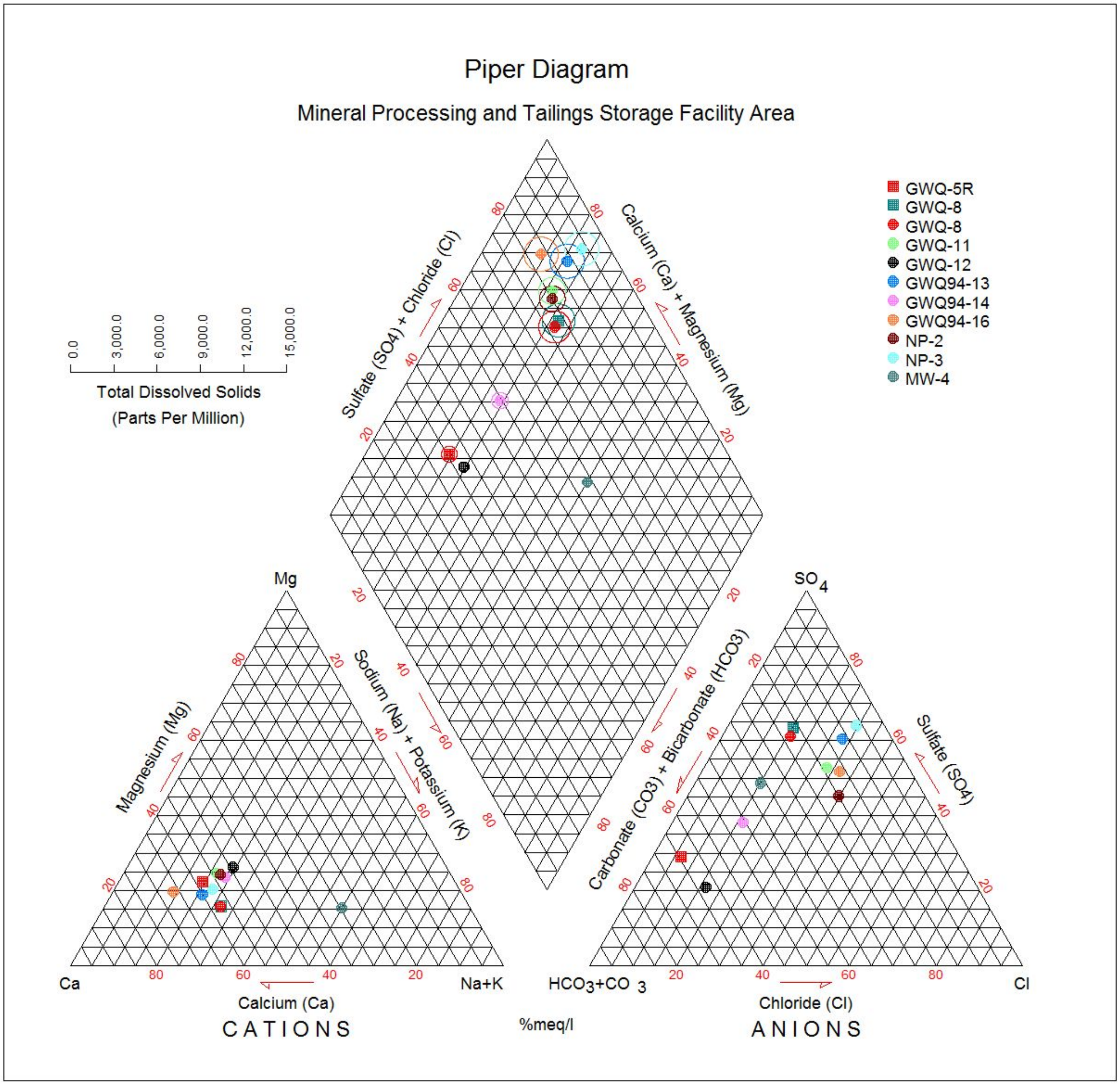
During the 2013 sampling program, water quality at GWQ11-24a (the shallower of the paired monitoring wells) did not meet New Mexico groundwater quality standards for pH, TDS, sulfate, fluoride, aluminum, cadmium, cobalt, copper, and manganese, providing a measurement indicator of 9. Water quality at GWQ11-24b (the deeper of the paired monitoring wells) did not meet New Mexico groundwater quality standards for TDS, sulfate, fluoride, and manganese providing a measurement indicator of 4. Based on the presence of sulfate as the dominant anion in this water rather than bicarbonate, the relatively higher TDS, and the exceedance of New Mexico groundwater quality standards for one or more metals, groundwater at both GWQ11-24a and GWQ11-24b is thought to be influenced by previous mining and natural groundwater conditions within the ore body. Groundwater quality at GWQ11-24a shows relatively greater impacts from mining with a measurement indicator of 9. The observed water quality effects at this location may be due to oxidation of sulfide minerals in near-surface rock units and leaching of previous products of sulfide mineral oxidation with subsequent infiltration to the water table.

Monitoring wells GWQ11-25a and GWQ11-25b are collocated on the north side of the mine pit. Groundwater at GWQ11-25a is calcium-sulfate water and groundwater at GWQ11-25b is sodium-sulfate water. The TDS concentrations at both locations are elevated with respect to the upgradient well pair, GWQ96-22a/GWQ96-22GWQ-22b. Based on the presence of sulfate as the dominant anion and elevated TDS concentrations, groundwater at both GWQ11-25a and GWQ11-25b is thought to be influenced by previous mining.

Groundwater quality at the shallower of the two wells, GWQ11-25a, does not meet New Mexico groundwater quality standards for pH, TDS, sulfate, fluoride, aluminum, cadmium, cobalt, copper, manganese, and zinc, providing a measurement indicator of 10. In contrast, water quality at GWQ11-25b exceeds New Mexico groundwater quality standards for TDS, sulfate, and fluoride only providing a measurement indicator of 3. The shallow groundwater at GWQ11-25a is relatively more affected by mining than the deeper groundwater at GWQ11-25b, which is the same relationship observed at GWQ11-24a and GWQ11-24b. This relationship supports the hypothesis presented above that the source of the contaminants in the water is attributable to oxidation of sulfide minerals in near-surface rock units and leaching of previous products of sulfide mineral oxidation with subsequent infiltration to the water table.

Groundwater in the Former Mineral Processing and Tailings Storage Facility Areas: Groundwater quality at some monitoring wells located downgradient from the former mineral processing area and the TSF also show evidence of mining influenced water (MIW) (JSAI 2014). Potential mining-related effects to groundwater in these areas include elevated concentrations of sulfate and TDS, but the metals concentrations meet the groundwater quality standards shown in Table 3-7. Selected groundwater quality monitoring locations in the former mineral processing and TSF areas and Piper diagram analyses of water quality samples collected at these locations are shown below. (See Figures 3-1 and 3-4.)

Figure 3-4. Piper Diagram of Baseline Groundwater Samples Collected in Mineral Processing and Tailings Storage Facility Area



Source: CDM Smith 2014.

Two monitoring wells are located in the Greyback Arroyo area between the former mineral processing area and the TSF: GWQ-5R and GWQ-3. GWQ-5R monitors groundwater quality within the crystalline bedrock aquifer, whereas GWQ-3 monitors groundwater quality within the Santa Fe Group sediments aquifer. Groundwater at GWQ-5R is calcium-bicarbonate water with relatively low TDS. Groundwater at this location meets New Mexico groundwater quality standards. (See Table 3-10.) In contrast, groundwater at GWQ-3 is calcium-sulfate water with elevated concentrations of TDS.

Groundwater at GWQ-3 exceeded the New Mexico groundwater quality standard for TDS and sulfate during the 2013 sampling event associated with the Stage 1 Abatement Plan (JSAI 2013). Accordingly, the value of the water quality measurement indicator is 0 at GWQ-5R and 2 at GWQ-3.

During the Quintana Minerals mining operations, tailings were placed into the permanent TSF constructed east of the other mine surface facilities. Adverse effects to groundwater underlying the TSF have been documented in a series of groundwater monitoring wells as described by Intera (2012). Currently, groundwater located within a zone extending up to 1,000 feet downgradient of the TSF exceeds New Mexico groundwater quality standards for sulfate and TDS. Water quality at nine monitoring wells in this area was reviewed to assess the existing conditions of groundwater to support the effects analysis. Table 3-11 summarizes the water quality characteristics and measurement indicators for these wells.

Table 3-11. Water Quality Characteristics and Measurement Indicators for Wells in the TSF Area

Table 3-11. Water Quality Characteristics and Measurement Indicators for Wells in the TSF Area		
Monitoring Well	**Water Quality Characteristics**	**Value of Water Quality Measurement Indicator (TDS)**
GWQ-8	Calcium-sulfate water with elevated TDS	1
GWQ-11	Calcium-sulfate water with moderate TDS	0
GWQ-12	Calcium-bicarbonate water with low TDS	0
GWQ94-13	Calcium-sulfate water with elevated TDS	1
GWQ94-14	Calcium-bicarbonate water with low TDS	0
GWQ94-16	Calcium-sulfate water with elevated TDS	1
NP-2	Calcium-sulfate water with moderate TDS	0
NP-3	Calcium-sulfate water with elevated TDS	1
MW-4	Sodium-sulfate water with low TDS	0

The tailings were pumped into the unlined tailings facility as a slurry of water and tailings, and the pore water contained in the tailings slurry drained over a period of years following placement. The existing effects to water quality present in the TSF area are thought to be primarily related to initial dewatering of the tailings, and infiltration of this MIW into groundwater underlying the facility. It is possible that ongoing discharges of MIW from the TSF are occurring, but no site-specific data regarding ongoing seepage of MIW from the TSF are available.

3.4.2 Environmental Effects

3.4.2.1 Proposed Action

The following sections address potential water quality effects with respect to pit lake water quality and to surface water and groundwater quality in other areas.

Pit Lake Water Quality: Under the Proposed Action, the existing open pit would be enlarged to facilitate production of 96 million tons of ore, 37 million tons of waste rock, and 19 million tons of low-grade ore. In total, approximately 152 million tons of rock would be excavated from the open pit over approximately 16 years. The enlarged open pit would be approximately ½ mile in diameter and 900 feet deep. Reclamation at the open pit would consist of mitigating unstable pit walls by blasting or other safe methods, selective placement of soil on the benches above the anticipated water elevation of the post-mining pit lake, construction of water bars within the pit to mitigate erosion, and construction of fences or other barricades to limit public access to the area.

A pit lake is expected to re-form in the open pit after mining is complete as a result of inflows from groundwater and precipitation. Groundwater is expected to flow into the pit lake continuously after mining ceases. Periodic inflows of surface water would also occur when runoff from highwalls and slopes surrounding the open pit flows into the pit lake after major precipitation events. The pit lake is expected to form slowly over a period of decades to centuries, because of the semi-arid environment in the area. The inflow rate from groundwater would be highest in the initial decades after mining is complete when the gradient causing groundwater to flow into the pit is highest. As this gradient decreases over a period of decades, the groundwater inflow rate would also decrease, but groundwater would continue to flow into the pit lake. Ultimately, the water level of the pit lake would be controlled by the balance between inflows from groundwater and surface water and outflows from evaporation.

The time required for the pit lake to form was estimated by John Shomaker and Associates Inc. (JSAI) using a groundwater model developed to support the project (JSAI 2013b; JSAI 2013c). It is estimated that the pit lake would fill to an elevation of approximately 4,900 feet within 100 years after mining is complete. At that time, the depth of the pit lake would be approximately 200 feet. The total depth of the open pit would be approximately 900 feet; therefore, only the lower part of the open pit would be filled with water 100 years after mining ceases.

Predictions of the post-mining water quality of the pit lake include uncertainties that are not fully quantifiable due to existing technologies (Kempton et al. 2000). Pertinent uncertainties include:

- The rate of mineral oxidation and associated contaminant release from mineralized rocks in the pit highwalls, which controls the chemistry of inflowing surface water (i.e., runoff from storm events);
- Potential seasonal or permanent stratification of the pit lake and associated uncertainties in the extent of seasonal mixing and other factors that control metal solubility;
- The chemistry and inflow rate of groundwater after mining is complete;
- The rate of removal of dissolved solids in the pit lake through adsorption and mineral precipitation reactions;
- The primary and secondary mineral species that will be present on pit highwalls and within the pit lake in the future, and the associated thermodynamic parameters for these minerals, which are used in the model; and
- Potential changes in climate that may occur in the future associated with either natural or anthropogenic factors.

Therefore, assessment of the post-mining pit lake water quality is evaluated in this document using a weight of evidence approach that includes evaluation of the water quality of the existing pit lake and predictive geochemical modeling of future pit lake water quality completed by SRK Consulting for THEMAC (SRK 2013a).

The chemistry of the existing pit lake is useful to understand the potential chemistry of the new pit lake, because the existing pit lake has formed over the last approximately 30 years at the site and reflects site-specific geological, mineralogical, hydrogeological, and climatological conditions. The geology, mineralogy, and hydrology are expected to vary somewhat as the existing open pit is enlarged. For example, the sulfide oxidation rate of potentially acid generating rocks at depth in the mineral deposit is slower than the sulfide oxidation rate of rocks near the surface (SRK 2014; SRK 2013b), the hydraulic conductivity at depth is likely to be lower than rocks relatively nearer to the surface, and the distribution of minerals that may affect water quality is expected to vary with depth. However, because an existing pit lake is present at the site, water sample data from the existing pit lake provides an empirical basis to evaluate potential water quality in the future pit lake.

The water quality of the existing pit lake was summarized in Section 3.4.1. The water is near-neutral pH, high TDS calcium-sulfate water with concentrations of four water quality parameters that exceeded the applicable water quality standards during baseline sampling. The existing pit lake water quality does not meet its current designated uses of warmwater aquatic life, livestock watering, or wildlife habitat. This empirical data suggests that there is potential that the new pit lake may not meet water quality standards in the future. However, it must be noted that the applicable water quality standards may be different in the future, and the future standards may be either more or less stringent depending on the designated uses of the pit lake, the water quality standards that apply to those uses, future research regarding the toxicity of metals and metalloids in surface water and other factors. Based on this analysis of empirical data, the value of the water quality measurement indicator for the Proposed Action would be 4 (cadmium, copper, manganese, and selenium).

SRK (2013a) completed predictive geochemical modeling of the post-mining pit lake water quality using current best practices. However, there is uncertainty regarding whether current best practices are sufficient to provide confident predictions of pit lake water quality decades or centuries in the future (Kempton et al. 2000; Kuipers, et al. 2006; Maest et al. 2006; Eary et al. 2009; and NRC 1999). This type of prediction approach was developed over the last approximately 20 years to assist land managers and other environmental regulatory authorities in understanding potential post-mining pit lake water quality to support mine permitting activities and disclosure of environmental effects of proposed mines in accordance with NEPA. The SRK (2013a) predictive geochemical model is useful to understand the general water quality that may be present decades or centuries in the future, but the model predictions are only estimates and the level of uncertainty in the model predictions cannot be fully quantified (Kempton et al. 2000).

The details of the SRK predictive geochemical model are available in Predictive Geochemical Modeling of Pit Lake Water Quality at the Copper Flat Project, New Mexico (SRK 2013a). The water quality predictions are summarized here with respect to the water quality measurement indicators. SRK (2013a) predicts that the pit lake water quality 100 years in the future will be near-neutral pH, high TDS, calcium-sulfate water, which is similar to the water present in the existing pit lake. SRK (2013a) predicts that the water quality in the new pit lake will meet many water quality standards, but would exceed the currently applicable water quality standards for copper, lead, manganese, selenium, and zinc if no control measures applied.

Based on the SRK (2013a) predictions presented above, the value of the water quality measurement indicator for the Proposed Action would be 5 (copper, lead, manganese, selenium, and zinc). This is higher than the existing condition of this measurement indicator, which is 4 (cadmium, copper, manganese, and selenium). NMCC is currently undergoing a use attainability analysis that may potentially modify the default designated uses. If the applicable use designations or water quality standards do not change in the future, the new pit lake would not be expected to meet the designated uses of warmwater aquatic life or wildlife habitat if no control measures applied based on the predictions of SRK (2013a). It would meet the applicable standard for livestock watering.

Calcium and sulfate are major ions in the water, and forward-looking predictions of major ion concentrations are generally thought to be reliable in pit lake models that are developed using current best practices. Copper, lead, manganese, selenium, and zinc are trace ions in the water, and forward-looking predictions for the concentrations of these ions are relatively less reliable because of inherent uncertainties in existing prediction technologies (Eary and Shafer 2009). These inherent uncertainties support the use of the SRK predictions as only one component of the overall weight of evidence approach to assess future pit lake water quality.

However, the water quality standards that would apply 100 years in the future are also uncertain. There is potential that the applicable water quality standards may be different in the future. For example, the Federal Clean Water Act requires that States review their surface water quality standards every 3 years in the "triennial review" and adjust their standards to comply with USEPA recommendations.

The surface water quality standards may also be modified using two approaches: a use attainability analysis or site-specific water quality standards. A use attainability analysis is being conducted to evaluate if the pit lake was capable of attaining a designated use such as warmwater aquatic life based on physical, chemical, biological, or other factors (20.6.4.15 NMAC). For example, if the New Mexico Water Quality Control Commission determined, based on the use attainability analysis, that the pit lake did not provide sufficient habitat to support warmwater aquatic life, that designated use could potentially be removed from the pit lake, effectively making the applicable water quality standards less stringent than the currently applicable standards.

The applicable water quality standards could also be modified through development of site-specific water quality standards. This approach involves identifying the biological species that could potentially be present in the water body, and developing site-specific water quality standards that are protective of species that have potential to be present in the water body. Development of site-specific water quality standards would also require approval by the New Mexico Water Quality Control Commission.

A final source of uncertainty in future pit lake water quality regulations relates to Federal jurisdiction over pit lake water quality. The Federal Clean Water Act does not specifically address pit lakes, which historically has left some flexibility in the approaches that States use to regulate pit lake water quality (Bohlen 2002). The U.S. Army Corps of Engineers determined that the Copper Flat pit lake is not subject to regulation under Section 404 of the Clean Water Act because it "is an isolated water without surface water or groundwater connection to the nearest surface drainage, Greyback Arroyo" (U.S. Department of the Army 2014). However, traditionally, the USEPA has taken a broad interpretation regarding Federal jurisdiction over surface water quality (Galager 1995), and the State of New Mexico has authority to promulgate water quality standards for the pit lake regardless of Federal jurisdiction over those waters.

Because both the future pit lake water quality and the water quality standards that will apply to the pit lake decades or centuries in the future are uncertain, it is recommended that mitigations be developed to provide for post-mining compliance with water quality standards. These mitigations are proposed as: 1) modifications to the proposed MPO, which would be required prior to BLM approval; and 2) terms and conditions of approval for the proposed MPO, which would be stipulated by the BLM and the operator.

The following modifications will be made to the proposed MPO prior to BLM approval:

- The proponent shall modify the MPO to include appropriate mitigations to protect pit lake water quality.
- The proponent shall provide a preliminary pit lake water quality management plan, which describes reclamation, water quality management, and monitoring activities that would be conducted to facilitate compliance with applicable water quality standards during the post-mining monitoring period.

The following terms and conditions of approval shall be stipulated for the proposed MPO:

- The pit lake water chemistry shall meet applicable water quality standards during the post-mining monitoring period, which is defined as 30 years after completion of reclamation at the Copper Flat mine.
- At least 1 year prior to mine closure, the proponent shall update the pit lake water quality management plan and provide this final plan to the BLM for review and approval. The final plan shall detail reclamation, water quality management, and monitoring activities that would be conducted to facilitate compliance with applicable water quality standards during the post-mining monitoring period.
- The proponent shall provide a cost estimate for implementation of the pit lake water quality management plan for BLM review and approval.
- The proponent shall provide a trust fund or other long-term funding mechanism in accordance with 43 CFR 3809.522(c), which will be sufficient to fund implementation of the pit lake water quality management plan for a period of at least 30 years.

The final pit lake water quality management plan would be developed and submitted to the BLM for review and approval towards the end of the active mining period, but no later than 1 year prior to closure of the mine. This would allow for consideration of the surface water and groundwater standards that apply to the pit lake at that time and would provide for incorporation of site-specific geochemical and hydrogeological data developed during the mine operations. This would reduce current uncertainties associated with: 1) predicting the future surface water and groundwater quality standards that would be applicable to the pit lake; 2) characterizing the geochemical characteristics of the pit highwalls, because the actual geochemical characteristics of the highwalls could be monitored and characterized as the pit is constructed; and 3) characterizing the post-mining hydrogeological conditions in the pit area. Therefore, the proposed timing for submittal and approval of the final pit lake water quality management plan would provide for an improved understanding and characterization of the factors that affect post-mining water quality in the pit lake, and improve the probability that the pit lake water quality management plan would be effective in preventing unnecessary or undue degradation as required by 43 CFR 3809 regulations for locatable mining operations.

The pit lake water quality management plan may include rapidly filling the pit lake with water at mine closure to the predicted ultimate water level rather than allowing it to fill naturally over a period of decades to centuries, and potentially conditioning this water with the addition of non-toxic alkaline or organic materials. Rapid filling would occur by pumping the mine production wells at approximately 3,000 gallons per minute (gpm) for about 7 months. This is a rate nearly the same as pumping requirements for mine operation; therefore, there would be no change to the predicted final drawdown of groundwater (see Section 3.6) and the pumping would fit within the annual allowed NMCC water right. The total pumped volume would be about 2,800 AF, pumped into the bottom of the pit via a temporary high-density polyethylene (HDPE) pipe laid along the haul road. Rapid filling would introduce good quality water, dilute solutes derived from water-rock interaction, submerge walls and benches to limit oxidation of sulfide minerals, stabilize pit water quality, and create a steady state hydraulic sink in the near term rather than waiting for natural refilling of the pit. Starting water chemistry would resemble 98 percent supply well water and 2 percent stormwater runoff from the pit shell. Recovery of water levels would be delayed for 6 months to a year (NMCC 2015c).

Filling the pit lake with water at cessation of mining would reduce potential oxidation of sulfide minerals that are exposed on the pit floor and highwalls. Data presented in SRK (2013b) shows that sulfide minerals are expected to be encountered in portions of the mine pit and that these minerals have the potential to oxidize and adversely affect water quality. However, the expected oxidation rate of these minerals is relatively slow based on kinetic testing and mineralogical analyses. If the pit lake is allowed to form naturally over a period of decades to centuries, these sulfide minerals would be exposed to atmospheric concentrations of oxygen (approximately 21 percent) for a long period. This could cause adverse effects to pit lake water quality when the pit lake eventually forms and the soluble products of sulfide mineral oxidation are transported into the pit lake. By filling the pit lake with water at the cessation of mining, potential oxidation of sulfide minerals in the floor and lower highwalls of the pit would be mitigated, because permanent submergence is an effective means to prevent sulfide mineral oxidation and the associated release of trace metals and other soluble constituents (INAP 2014). This is based on existing exploration and development drilling data. The geochemical characteristics of the ore body will would be far better defined as the mine is constructed. In the SRK Consulting pit lake modeling report, Table 3-1 (3D Surface Areas of Pit Wall Rock Material Types) and Figure 3-2 (Exposed Material Types in Final Pit Walls) provide information regarding the anticipated exposure of material types, oxidation, and surface area on the pit walls (SRK 2013a).

Filling the pit lake with water during reclamation would also provide an opportunity to submerge additional acid generating materials that may be present in highwalls at elevations above the ultimate pit lake elevation. This could be accomplished with selective excavation and placement of these materials beneath the water level of the pit lake. Although the majority of the exposed highwalls are expected to contain rocks with relatively low potential for acid generation based on humidity cell testing, several rock units have relatively higher potential to generate acid and adversely affect water quality (transitional quartz monzonite porphyry, quartz feldspar breccia, and biotite breccia). It is anticipated that exposures of these rock units that remain in the pit highwalls at the end of the mine life may be mitigated by selective excavation using cast blasting or other approaches and placement into the base of the pit. Permanent submergence of these materials is an effective approach to mitigate sulfide oxidation and prevent adverse effects to pit lake water quality (INAP 2014).

It is expected that the pit lake water quality management plan would also include construction of vegetated soil covers over exposed rock surfaces and mine waste rock dumps to reduce the potential for adverse effects to pit lake water quality. Where feasible based on the slope of the pit highwalls, safety benches, and internal haul roads, a vegetated soil cover could be installed to limit interaction of precipitation with exposed rock surfaces within the pit that contain sulfide minerals. Discharges from mine waste rock dumps near the pit could also be a potential source of inflows of contaminated water into the pit lake, but these inflows are expected to be mitigated through placement of a vegetated soil cover over acid generating waste rock during reclamation.

As mentioned previously, it is also anticipated that the pit lake water quality management plan may include conditioning the water that is pumped into the pit lake with non-toxic alkaline or organic additives that would reduce the potential for adverse water quality affects to occur. Although most of the rock units that would be exposed in the pit highwalls both above and below the predicted final water level of the pit lake have been shown to oxidize very slowly, it is possible that some oxidation may occur over the estimated 16-year mine life. The oxidation process can lead to development of vestigial acidity, which is a term used to describe soluble products of sulfide oxidation that could form during active mining (Younger et al. 2000). Bicarbonate is a component of most natural waters that affects the buffering capacity of the water. The term 'buffering' refers to the ability of the water to resist pH changes, such as the potential reduction in pH that may occur in response to dissolution of vestigial acidity from mine rocks. By conditioning the water that is pumped into the pit lake with alkaline substances, the potential for pH changes in the pit lake caused by dissolution of vestigial acidity could be mitigated. Filling of the pit lake with water at the end of active mining coupled with conditioning of the water with alkaline additives was used at the Sleeper Mine pit lake in Nevada to mitigate potential adverse water quality affects associated with dissolution of vestigial acidity (Dowling et al. 2004), and alkaline additions to existing pit lakes have been used at numerous mine pit lakes in Germany and Sweden (Geller and Schultze 2013).

The pit lake water quality management plan may also include conditioning of the water during reclamation through the addition of natural organic materials, which have been shown to be effective in improving pit lake water quality through natural biological processes at the Gilt Edge Mine in South Dakota (Park et al. 2006) and at several pit lakes in Canada (Kalin and Wheeler 2013). An advantage of this approach is that the natural biological processes also generate alkalinity, which can offset periodic additions of vestigial acidity from exposed pit highwalls after reclamation is complete. Post-mining pit lake treatment could be achieved via pH adjustment (e.g., addition of lime or sodium hydroxide) and addition of organic materials (e.g., carbon sources such as molasses) to achieve reducing conditions and stimulate biological activity of sulfate reducing bacteria. This provides a sustainable approach for pit lake water quality management that does not require perpetual additions of alkaline materials (Geller and Schultze 2013).

It is expected that the overall pit lake management plan would be optimized though several processes including:

- Reducing, to the extent practicable, post-mining inflows of contaminated water caused by oxidation of sulfide minerals in pit highwalls;
- Filling of the pit lake with water to rapidly submerge sulfide minerals that would be exposed on the pit floor and lower highwalls;
- Selective excavation of acid generating rocks that would be exposed in the pit highwalls above the pit lake water level and submergence of these materials within the pit lake;
- Conditioning of the water pumped into the pit lake during reclamation with alkaline or organic materials designed to provide a sustainable source of alkalinity and reduce potential long-term pit lake management requirements; and
- Mitigation of potential inflows of contaminated water from exposed rock surfaces and mine waste rock dumps within and near the pit through placement of vegetated soil covers during reclamation.

Assuming that the recommended mitigations are implemented and effective, the expected value of the water quality measurement indicator for the pit lake would approach zero, and the pit lake would be expected to meet applicable water quality standards and designated uses. This would be an improvement as compared to existing conditions, because the value of the pit lake water quality measurement indicator for the existing condition is 4.

Criteria for evaluating the significance of effects to surface water quality were introduced in Section 3.1. These criteria address magnitude, extent, duration, and likelihood of impacts.

Surface Water and Groundwater Quality: Apart from potential water quality issues associated with the pit lake, there are other activities associated with the Proposed Action that could affect surface water or groundwater quality. These activities include:

- Construction, operation, and reclamation of waste rock disposal and low-grade stockpile facilities;
- Expansion of the existing mine pit and associated dewatering;
- Expansion, operation, and reclamation of the TSF;

- Non-point source pollution from disturbed areas on the mine area; and
- Spills or other anticipated releases of hazardous substances into the environment.

The potential direct and indirect effects of these activities on surface water and groundwater quality are assessed in the following sections.

3.4.2.1.1 Mine Development and Operation

Waste rock is rock that would be excavated from the open pit that does not contain a sufficient quantity of copper, molybdenum, or other payable metals to profitably recover in the mineral processing plant. This rock is termed waste rock in common mining terminology. Both ore and waste rock would be produced from the open pit in varying proportions throughout the mine life depending on factors such as the design of the open pit (e.g., the required slope of the highwalls and the areal extent of the pit at various depths); the three-dimensional form of the ore body; and economic factors (e.g., metal prices, fuel prices, and other variable costs of production). Under the Proposed Action, waste rock would be placed into WRDFs near the open pit. Although waste rock does not contain a sufficient natural enrichment of payable metals to support economic production, it is common for waste rock to contain slightly enriched concentrations of metals or mineral assemblages with potential to affect the environment.

A low-grade stockpile would also be constructed under the Proposed Action. A low-grade stockpile consists of waste rock that contains concentrations of copper, molybdenum, or other payable metals that may be sufficient to warrant mineral processing at some time in the future. This processing may be done at the end of the mine life or during active mining. It is also possible that this rock would never be processed, and that the low-grade stockpile would be reclaimed in place at the end of the mine life.

The potential for waste rock or low-grade to affect the environment is based on several interrelated factors:

- Geochemical characteristics of the rock;
- Hydrological characteristics of the rock;
- Climate – in particular the amount of annual precipitation and evaporation at the mine;
- WRDF construction and reclamation practices; and
- Hydrological characteristics of the growth media used to cover the waste rock facilities during reclamation.

Detailed information regarding environmental characteristics of waste rock is provided in Geochemical Characterization Report for the Copper Flat Project, New Mexico (SRK 2013b); Humidity Cell Termination Report for the Copper Flat Project, New Mexico (SRK 2014); and Baseline Characterization Report for Copper Flat Mine, Sierra County, New Mexico (Intera 2012).

The work conducted by SRK (2013b; 2014) shows that the waste rock produced at the Copper Flat mine would exhibit varying geochemical characteristics based on the degree of previous weathering, variations in lithology and mineralization, and other factors. Characterization of the rock included detailed testing using a variety of methods designed to assess the potential for the rock to generate acid rock drainage (ARD) or to produce leachate that contains concentrations of metals or other elements that exceed applicable water quality standards. This work was conducted using current best practices for characterization of mine rock, and the data are sufficient to support this NEPA evaluation.

A summary of the findings of the geochemical characterization program is presented below. (See Table 3-12.) The table includes data for two rock units that are defined based on geochemical characteristics.

Transitional rock is partially oxidized near-surface rock that contains both partially oxidized sulfide minerals and products of previous sulfide mineral oxidation. Sulfide rock is relatively less weathered and occurs at greater depth.

Table 3-12. Summary of the Geochemical Characteristics of Waste Rock and Ore

<table>
<tr><th colspan="4">Table 3-12. Summary of the Geochemical Characteristics of Waste Rock and Ore</th></tr>
<tr><th rowspan="4">Rock Type</th><th colspan="3">Degree of Oxidation</th></tr>
<tr><th>Lithology</th><th>Transitional</th><th>Sulfide</th></tr>
<tr><td>Waste Rock</td><td>High potential to generate ARD or other deleterious leachate if sufficient percolation occurs. This rock was shown to be acid generating and to contain soluble products of previous sulfide mineral oxidation based on field paste pH analyses, modified Sobek acid base accounting, net acid generation tests, and humidity cell tests.</td><td>Moderate potential to generate ARD or other deleterious leachate if sufficient percolation occurs. The sulfide waste rock does contain sulfide minerals that could oxidize and affect the environment based on modified Sobek acid base accounting data and to a lesser extent, net acid generation tests. However, humidity cell testing showed that this rock is expected to oxidize slowly, and that neither acid generation nor release of other deleterious leachate would be expected in the short term (i.e., years to decades). The slow oxidation rate is attributed to encapsulation of sulfide minerals in other minerals, which markedly slows the rate of sulfide mineral oxidation.</td></tr>
<tr><td>Ore</td><td>High potential to generate ARD or other deleterious leachate if sufficient percolation occurs. The transitional ore showed similar geochemical characteristics to the transitional waste rock based on modified Sobek acid base accounting, Net Acid Generation tests, and humidity cell tests.</td><td>Moderate potential to generate ARD or other deleterious leachate if sufficient percolation occurs. The geochemical characteristics of this rock are similar to the sulfide ore.</td></tr>
</table>

Sulfide rock also contains sulfide minerals, but these sulfide minerals oxidize slowly relative to the transitional rock unit.

In general, the geochemical test work shows that near-surface transitional waste rock and low-grade ore is likely to generate ARD or other deleterious leachates if sufficient percolation occurs through the piles. This conclusion is supported by field and laboratory testing of representative samples collected from the existing waste rock dumps, surface exposures and drill core. In contrast, the sulfide waste rock and ore has potential to generate ARD and other deleterious leachate at some time in the future, but kinetic laboratory testing (i.e., humidity cell tests) suggests that it may take decades to centuries for the sulfide waste rock and ore to oxidize sufficiently to produce ARD or other deleterious leachates. The majority of the rock that would be excavated under the Proposed Action would be sulfide waste rock and ore with limited potential to adversely affect water quality in the short term. However, several million tons of transitional ore and waste rock are planned to be mined under the Proposed Action, and this volume of rock would have potential to cause adverse effects to water quality if leachate is produced.

As discussed previously, the geochemical characteristics of the rock is only one factor that controls the potential for the waste rock or low-grade ore to affect surface or groundwater quality. A second important factor is the climate of the mine area, particularly the ratio of precipitation to evaporation. Average annual precipitation in the mine area is estimated to be approximately 13 inches per year, with most precipitation occurring during the summer. In contrast, evaporation in the area is estimated to be approximately 64.6 inches (JSAI 2013), which is approximately 5 times the annual precipitation. In addition, evaporation is highest in the summer months, when the majority of the annual precipitation occurs. Therefore, most of the precipitation that falls on the waste rock dumps and the low-grade stockpile is expected to evaporate, with only a small fraction of precipitation expected to percolate into the rock piles.

When rock is mined from an open pit, the blasting and mining process produces broken rock with a substantial water holding capacity. Discharge of leachate from the base of the rock piles would not be expected until this available water holding capacity is expended. The term “field capacity” refers to the volume of water that a soil or broken rock will hold by gravity prior to drainage of water by gravity. This water is held within the pores of the rock pile by surface tension. In arid and semi-arid areas of the western U.S., hydrological modeling has shown that it may take centuries before waste rock reaches field capacity and leachate generation commences (Kempton et al. 2000).

Run-on of stormwater from adjacent areas upslope from the planned waste rock dumps and the low-grade stockpile could increase the volume of water that enters the rock piles. Depending on the flow path of the stormwater, this water could cause generation of leachate from the pile during mine operations if it flowed into the rock piles, interacted with transitional waste rock or low-grade ore, and discharged. The Proposed Action would include construction of berms and diversion ditches to convey stormwater around the rock piles to reduce the potential for generation of leachate by this mechanism during operations. This stormwater would be collected and utilized in the mineral processing system to reduce the quantity of water that is required to be pumped from the groundwater supply wells.

Because the mine would be located in an area where annual evaporation greatly exceeds precipitation, the waste rock and low-grade ore would have substantial water holding capacity at the time it is placed, and berms and diversion ditches would be constructed to convey stormwater around the rock piles. Neither discharge of ARD nor other deleterious leachate from the waste rock dumps or low-grade stockpile would be expected during the life of the mine assuming that all berms and diversion ditches are properly designed, constructed, and maintained through the life of the mine. However, there is potential that the waste rock or low-grade ore would eventually reach field capacity, and that percolation could occur at some time centuries in the future unless the rate of percolation of water into the pile is mitigated during reclamation.

Technologically Enhanced Naturally Occurring Radioactive Materials: The potential for the Proposed Action to cause generation of technologically enhanced naturally occurring radioactive materials (TENORM) was raised as an issue during public scoping. When naturally occurring radioactive materials in their undisturbed natural state (NORM) become purposefully or inadvertently concentrated either in waste byproducts or in a product, they become TENORM. TENORM is defined as any naturally occurring radioactive material whose radionuclide concentrations or potential for human exposure has been increased above levels encountered in the natural state as a result of human activities (NAS 1999). Trace quantities of naturally occurring radioactive elements are present in minerals associated with porphyry copper deposits, and some copper extraction and beneficiation operations concentrate these radioactive materials and produce TENORM.

In 1999, the USEPA developed a report to provide a better understanding of TENORM at copper mining and mineral processing sites (USEPA 1999b). That report indicated that copper leach operations that use solvent extraction-electrowinning circuits may extract and concentrate soluble radioactive materials producing TENORM. The radioactivity appears to be associated with copper mineralization that contains trace quantities of uranium. The USEPA report evaluated the potential to generate TENORM at copper mining and mineral processing sites and, in particular, evaluated two common mineral processing techniques: solvent extraction and electrowinning (SX-EW) and froth flotation.

Selection of SX-EW versus froth flotation to extract copper from ore is based on the natural mineralogy of the ore. Oxide ores are efficiently processed using the SE-EX process, usually using a heap leach or dump leach process. In contrast, ore deposits containing copper sulfide minerals are processed using the froth flotation process.

The SX-EW process consists of applying an acidic solution to a rock dump or heap leach pad to dissolve the copper (i.e., solvent extraction). The leachate is then recovered and pumped to holding ponds for processing at an electrowinning plant. Once the copper is removed from solution by electrowinning, the leach solution is recycled, additional sulfuric acid is added as needed, and the leach solution is pumped back to the rock dump or leach pad for another cycle of SX-EW. Because uranium is not recovered in the electrowinning process, the uranium may remain dissolved in the leach solution, and multiple leaching cycles may contribute to inadvertent concentration of uranium. This process may generate TENORM (USEPA 1999b).

In the froth flotation process, copper sulfide ore is crushed and ground to liberate the copper minerals and increase the surface area of the minerals for flotation. The powdered ore is mixed with pine oil (the ‘collector chemical’), which reacts with the copper sulfide minerals to make them hydrophobic. The mixture is introduced into a water bath (aeration tank) containing a surfactant. Air is constantly forced through the slurry and the hydrophobic mix of copper and pine oil latches onto and rides the air bubbles to the surface, where it forms froth and is skimmed off. These skimmings are cleaned of the collector chemical and surfactant, producing copper concentrate. The remainder is discarded as tailings, or processed to extract other elements. TENORM is not generated during the froth flotation process. Under the Proposed Action (and all action alternatives), the froth flotation process would be used to process the copper ore. This is related to the natural mineralogy at Copper Flat, with copper occurring primarily in copper sulfide minerals. Because the froth flotation process does not concentrate uranium or other naturally occurring radioactive materials, generation of TENORM would not occur under the Proposed Action (or the other action alternatives).

3.4.2.1.2 Mine Closure/Reclamation

The proposed reclamation plan for the waste rock dumps and low-grade stockpile included in the Proposed Action consists of:

- Regrading waste rock dumps (and the low-grade stockpile if reclaimed in place) to blend with adjacent topography and reduce slopes to a grade of approximately 3h:1v or less;
- Establishing permanent stormwater diversions to route stormwater around waste rock dumps;
- Constructing slope breaks on waste rock dumps (and low-grade stockpile if reclaimed in place) to reduce erosion of growth media;
- Placing growth media over the cover materials in compliance with State requirements;
- Amendment of the growth media with fertilizer or organic matter; and
- Reseeding of native grasses, forbs, and shrubs.

The general term growth media is used in this evaluation rather than a more specific term such as topsoil, because various natural materials would be stockpiled during construction of the mine for use as growth media during reclamation. Primary considerations for selection of growth media are the quantity required to support reclamation and the available water holding capacity of the materials. Although the proposed MPO (NMCC 2012c) indicates that there is a potential shortage of available topsoil to stockpile during construction of the mine, a supplemental soils investigation has determined that cover materials sufficient to meet cover requirements of up to 36 inches will be obtained from within the Copper Flat mine area (THEMAC, 2015).

All topsoil in areas that would be disturbed by the operation would be excavated and placed into stockpiles to store and preserve this important resource for reclamation. An important feature of topsoil is the presence of decomposed organic matter and bacteria, fungi, and other organisms that make the topsoil biologically active. These organisms are important to critical soil processes such as decomposition of organic matter and rendering nitrogen and other nutrients into plant-available forms. Commonly, when topsoil is stockpiled during mining or other land-disturbing activities, the biological activity of the soil and the organic matter content decreases over time (Munshower 1994). Accordingly, it is common practice during mine reclamation to amend stockpiled topsoil with fertilizer or organic matter.

The alluvial sediments that would be stockpiled are unlikely to contain sufficient organic matter, nutrients and biological activity to support reclamation at the time of stockpiling, but they are likely to contain adequate fine grained sediments (i.e., silt and clay) to provide water holding capacity when used as a growth media. These materials would also be amended with fertilizer and organic matter prior to use as a growth media, and would develop the biological activity associated with topsoil over time. Under the Proposed Action, the proponent would implement reclamation test plots during mine operations to optimize the type and quantity of soil amendments and the reclamation procedures required for use of alluvial sediments as growth media during final reclamation.

The proposed reclamation approach would decrease the amount of percolation that occurs through the waste rock dumps (and the low-grade stockpile if reclaimed in place) because the growth media would store water that percolates into the ground during precipitation events and hold that water until it is either evaporated or transpired by plants in a process termed evapotranspiration (ET). This would decrease the volume of water that would enter the waste rock or low-grade ore, and reduce the potential for leachate generation.

The reclamation approach proposed in the original MPO of applying 6 to 12 inches of soil to the surface of the regraded waste rock dumps (and low-grade stockpile, if necessary) has been revised to comply with current NMED rules for copper mines at NMAC 20.6.7.33F, which were implemented after submittal of the original MPO by NMCC. The Proposed Action in this EIS reflects compliance with current NMED rules for soil cover, and the governing MPO would be revised accordingly before mining operations commence. The geochemical testing of the waste rock and low-grade ore (SRK 2013b, 2014) indicates that the transitional waste rock has the potential to generate deleterious leachate if sufficient percolation of water through the rock piles occurs. The geochemical testing also indicates that the sulfide waste rock and low-grade ore has potential to generate acid or deleterious leachate some unknown time in the future, although this rock was shown to oxidize slowly based on kinetic laboratory tests. NMAC 20.6.7.33F contains several minimum requirements for reclamation of waste rock and low-grade ore with potential to adversely affect water quality:

- Placement of a cover system consisting of up to 36 inches of earthen materials, or as may be allowable within State requirements, that are capable of sustaining plant growth;
- Ensuring that these materials have the water holding capacity to store at least 95 percent of the long-term average winter (December, January, and February) precipitation or at least 35 percent of the long-term average summer (June, July, and August) precipitation, whichever is greatest; and
- Other specific requirements for diversion of stormwater, cover system design, and construction quality assurance.

The purpose of the thicker soil cover required by the NMED copper rules is to provide a store and release cover that would reduce percolation of water through the rock piles to a point at which adverse effects to surface water or groundwater quality are unlikely. This type of cover utilizes the available water holding capacity of the soil layer to store water that falls as precipitation and infiltrates into the soil layer, and release of that water back to the atmosphere through evapotranspiration. These store and release covers are gaining widespread acceptance for reclamation of landfills and mine areas in arid to semiarid climates (e.g., Benson et al. 2011; Williams et al. 2003; INAP 2014).

Installation of a thicker soil cover over the waste rock dumps during reclamation (and the low-grade stockpile if necessary) would reduce the volume of water that percolates through the waste rock and decrease the rate at which the moisture content of the rock would increase towards the field capacity. This would further reduce the potential that the reclaimed waste rock dumps or the low-grade stockpile would generate quantities of ARD or other deleterious leachates that would affect the environment. The performance of this mitigation approach would also require: 1) that run-on diversions remain functional during the post-reclamation period to reduce the potential that stormwater runoff from areas upslope of the reclaimed facilities interacts with the waste rock or low-grade ore and leads to generation of ARD or other deleterious leachates; and 2) that a self-sustaining vegetative layer develops on the reclaimed facilities, which would increase evapotranspiration of water stored within the soil cover and reduce the potential for erosion of the soil cover over time.

Accordingly, the following mitigations are intended to address potential water quality effects that could be caused by the waste rock dumps or low-grade stockpile. These mitigations would be applied as terms and conditions of approval for the MPO:

- Run-on diversions designed to divert stormwater generated in areas upslope from the waste rock facilities during active mining would be: 1) designed to convey the 24-hour 100-year design storm event; 2) constructed prior to placement of any waste rock or low-grade ore in the facilities; and 3) inspected regularly and maintained throughout the life of the mine and post-mining monitoring period.
- Reclamation of the waste rock dumps (and the low-grade ore storage facility, if necessary) shall include run-on diversions designed to convey the 24-hour 100-year design storm event. These diversions shall be designed to facilitate a minimum of long-term maintenance during the post-reclamation period.
- Reclamation of the waste rock dumps (and the low-grade ore storage facility, if necessary) shall comply with all requirements of the State of New Mexico.

Assuming that these mitigations are applied and effective, adverse water quality effects caused by waste rock or low-grade stockpiles are not expected. The significance of the water quality effects associated with the waste rock dumps and low-grade stockpile are summarized in Table 3-13.

Table 3-13. Evaluation of Significance Criteria for Water Quality Effects of Waste Rock Dumps and Low-grade Stockpiles

Significance Parameter	Discussion	Significance Classification	Overall Classification
Magnitude	No exceedance to applicable water quality standards would be expected	Minor	Not Significant
Extent	Potential effects would be localized to the area of the waste rock dumps and low-grade stockpiles	Minor	
Duration	Not applicable because water quality standards are not expected to be exceeded	Not Applicable	
Likelihood	Assuming that the recommend mitigations are applied, it is unlikely that adverse water quality effects would occur	Unlikely	

Expansion of the Existing Pit: During review of the current condition of groundwater quality near the existing mine pit, adverse effects to groundwater quality were identified at two locations. Paired shallow and deep monitoring wells are present in each of these locations, GWQ11-25a/GWQ11-25b. In each of these locations, adverse effects to water quality at the shallow wells were relatively more pronounced, although the data suggest that both the shallow and deep groundwater are influenced by mining at these locations. The elevated constituents in the deep groundwater could also be inherent in the ore deposit. These local areas of poor groundwater quality are within the capture zone of the existing evaporative sink at the pit lake, so this existing groundwater contamination is likely flowing into the pit lake and not migrating away from the existing pit. The specific cause of these local areas of poor groundwater quality is not known, but it is possible that lowering of the static groundwater level adjacent to the current pit and sulfide mineral oxidation and acid generation within the transitional rock units played a role in development of mining-influenced groundwater at these locations.

Based on the current presence of such contaminated groundwater within close proximity to the existing pit and the geochemical characteristics of the transitional waste rock and ore reported by SRK (2013b; 2014), there may be localized areas near the mine pit where groundwater quality could be affected in the future by the Proposed Action. The measurement indicators for monitoring wells GWQ11-24a/GWQ11-24b and GWQ1I-25a/GWQ1I-25b range from 3 to 10, and potential effects of the Proposed Action to water quality in the local area of the open pit may be of similar magnitude.

Expansion of the pit will require dewatering and the water that is taken from the pit will be used for dust suppression on roads or temporarily stored in an TSF during times of surplus. These activities would require the approval of the NMED. There would not be significant potential for impacts to groundwater or surface waters resulting from the disposition of the water from the pit. Although there are constituents present in the pit water that would otherwise be of concern as discussed earlier, there are certain mitigating factors regarding the intended use. Dust suppression activities on roadways require the application of only enough water to wet the surface while not creating hazardous conditions for traffic on the roadways. For this reason, the water on the surface is not present for a long enough time or in sufficient quantities to pose a significant risk to groundwater. The application and evaporation of applied water would likely result in the deposition of certain constituents on the surface of roadways; however, the runoff from the roadways would be controlled by the surface runoff features. Because of the deficit resulting from high evaporation rates and low precipitation, storage of surplus water in an TSF would be temporary and for a very short duration.

The final pit lake is expected to be a terminal lake, and therefore groundwater near the open pit would continue to flow into the future pit lake rather than migrating away from the pit lake. In order for water to flow away from the pit into groundwater, the hydrologic gradient would have to be higher than surrounding groundwater. Groundwater model output (JSAI 2015) indicates that the highest water level downgradient (east) of the pit is 200 feet above the pit's long-term maximum water surface elevation. Filling the pit the additional 200 feet that would result in flow from the pit into surrounding groundwater would require about 6,800 AF of water. The wettest year on record at Hillsboro (21 inches of precipitation in 1941) would have generated an estimated 82 AF of runoff to the pit. If small areas of mining-influenced groundwater develop near the expanded open pit, it is likely that this groundwater would continue to flow into the pit lake. Therefore, any adverse effects to groundwater quality in the area of the open pit are expected to be local in extent. An evaluation of the significance of potential adverse groundwater quality effects in the area of the open pit is provided below. (See Table 3-14.)

Table 3-14. Evaluation of Significance Criteria for Groundwater Quality Effects in Close Proximity to Open Pit

Table 3-14. Evaluation of Significance Criteria for Groundwater Quality Effects in Close Proximity to Open Pit			
Significance Parameter	**Discussion**	**Significance Classification**	**Overall Classification**
Magnitude	Water quality measurement indicators for local areas of groundwater near the expanded open pit would be near zero with recommended mitigations	Minor	Not Significant
Extent	Minor effects would be localized to the area of open pit, and mining-influenced groundwater is expected to flow into the pit lake	Small	
Duration	Minor water quality effects are likely to persist for an indefinite time after mining ceases	Long Term	
Likelihood	With recommended mitigations it is unlikely that effects to groundwater quality would occur	Unlikely	

Expansion, Operation, and Reclamation of Tailings Storage Facility: Under the Proposed Action, the existing TSF would be expanded and modernized with additional environmental protection infrastructure. As discussed previously, groundwater downgradient from the existing TSF is affected by MIW, which has caused the groundwater to exceed New Mexico groundwater standards for TDS and leads to a water quality measurement indicator for the existing condition in this area of 2.

During the previous operations, no geomembrane liner was constructed prior to disposal of the tailings in the TSF. The tailings were pumped into the TSF as slurry of process water and tailings, and the tailings slurry dewatered by gravity over time, which resulted in discharge of the process water to groundwater. There is potential that some small amount of seepage still occurs from the existing TSF, but it is thought that most of the water that discharged from the TSF over the last approximately 30 years originated from dewatering of the initial tailings slurry.

Under the Proposed Action, the existing tailings area would be regraded, including salvaging the existing tailings for reuse as liner bedding material, and a low permeability geomembrane liner would be installed and an underdrain system would be installed to convey tailings seepage into collection ponds located south of the tailings dam. The primary purpose of this liner is to capture water that drains from the tailings slurry to prevent discharge of this process water to the environment and to improve water conservation at the mine by recycling this water back to the mineral processing circuit. This liner would also isolate the existing tailings, and mitigate the potential for additional seepage from the facility in the future. Over time, this would result in declining concentrations of TDS in groundwater downgradient from the TSF as natural attenuation processes including dilution and advection slowly disperse the existing TDS plume. This would result in an improvement of water quality as compared to the No Action Alternative, which can be quantified by an expected reduction in the water quality measurement indicator for the TSF area from 2 to 0.

After the expanded and modernized TSF was put into operation, tailings would continue to be pumped to the TSF as slurry. The rate at which the tailings dewater and consolidate is dependent on the grain size and other physical characteristics of the tailings. The fine-grained tailings would dewater slowly, and it is unlikely that the tailings would be entirely dewatered at cessation of active mining and subsequent reclamation of the TSF. Therefore, there would be an expected post-closure environmental liability required, which would be associated with monitoring the dewatering process and managing the water that seeps from the TSF after it is reclaimed.

The required duration of this MIW monitoring and management requirement is unknown, but it could persist for years to decades after mine closure. Under the Proposed Action, this post-closure MIW seepage would be managed by periodically pumping the water from the collection facility and directing this to a small water holding area, and land then applied to reclaimed areas only if of suitable quality. The proposed post-closure seepage management approach has been amended to include the water holding area because the quality of the seepage without it would be unknown and would have created a post-closure environmental liability that would have required long-term maintenance of the site.

The following mitigations are intended to address the TSF. These mitigations would be applied as terms and conditions of approval for the MPO or as modifications to the proposed MPO, which would be required prior to approval.

- Prior to land application of seepage water from the TSF to reclaimed areas, the proponent would provide detailed chemical analyses of the water and an assessment of potential effects to vegetation or soils to the BLM. If the seepage water has the potential to adversely affect vegetation or soils, the proponent would propose an alternative management approach to the BLM for approval.
- The proponent shall obtain all necessary environmental permits from the State of New Mexico and the USEPA for management of seepage water.
- Prior to approval of the proposed MPO, the proponent shall modify the proposal to include a post-closure TSF seepage monitoring and management plan, and a cost estimate to complete this work.
- The cost of post-closure seepage monitoring and management shall be incorporated into a post-closure trust fund (or other long-term funding mechanism) established in accordance with 43 CFR 3809.552(c).

Non-point Source Pollution from Disturbed Areas on the Mine Area: The Proposed Action does not involve any point source discharges to surface water. However, there is potential for non-point source pollution to occur, which could be caused by stormwater interacting with disturbed areas of the mine such as haul roads, parking areas, equipment storage areas, or other ancillary facilities. Preliminary plans for stormwater pollution control facilities are described in the Proposed Action and include stormwater diversion structures at the waste rock dumps, low-grade stockpile, TSF, and in the area of the mineral processing plant. NMCC also proposes to manage stormwater pollution with the use of BMPs including seeding and mulching of disturbed areas, silt fences, straw bale check dams, diversion ditches with energy dissipaters, and rock check dams.

Potential non-point source pollution is regulated by the Federal Clean Water Act as amended and associated State and Federal regulations. Prior to initiating construction or mining activities, NMCC would need to obtain a Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity. This permit will require preparation of a Stormwater Pollution Prevention Plan (SWPPP); installation and use of BMPs for prevention of non-point source pollution from mine facilities; and routine inspection, maintenance, and recordkeeping for all stormwater pollution control facilities.

The following mitigations address potential non-point source pollution. These mitigations would be applied as terms and conditions of approval of the proposed MPO.

- Prior to initiation of mine construction or other surface disturbing activities, the operator shall obtain a Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity and comply with all requirements of that permit.
- Prior to initiation of mine construction or other surface disturbing activities, the operator shall provide final designs for stormwater diversion structures and other associated BMPs to the BLM for review.
- The SWPPP and all associated inspection and maintenance records shall be available for inspection by the BLM upon request.

Because non-point source pollution is regulated by existing laws and regulations and the proponent must comply with those laws, potential effects to water quality from non-point source pollution are not considered to be significant.

Spills or Other Unanticipated Releases: A preliminary spill contingency plan is included in the proposed MPO as required by 43 CFR 3809.401(a)(2)(vi). Various laws apply to storage and use of petroleum products, explosives and other potentially hazardous substances at mine sites including:

- BLM regulations at 43 CFR 3809.401(a)(2)(vi) require submittal of spill contingency plans as part of the MPO.
- USEPA regulations at 40 CFR Part 112 set forth additional requirements for storage of petroleum products including preparation of a Spill Prevention Control and Countermeasures (SPCC) Plan for facilities with above-ground oil storage of more than 1,320 gallons total.
- Regulations of the MSHA at 30 CFR Part 56 set forth additional requirements for storage and use of fuels and explosives at surface metal mines.

The preliminary spill contingency plan is adequate to support the proposed MPO and associated NEPA analysis. However, additional detail will need to be added to the plan, and the plan will need to be modified as necessary to reflect the final mine design prior to operations. Therefore, the following mitigation is to address potential water quality concerns that could be caused by spills or other anticipated releases of hazardous substances into the environment. This condition would be included as a term and condition of approval for the proposed MPO.

- Prior to commencement of mine construction, the operator shall provide an updated Spill Contingency Plan (SCP) that complies will all applicable State and Federal laws including 43 CFR 3809.401(a)(2)(vi), 40 CFR Part 112, and 30 CFR Part 56.

Because storage, use, management, and spill response for petroleum products, explosives, and other potentially hazardous substances is already addressed by existing laws and regulations, and the operator must comply with those laws, potential adverse effects to water quality associated with spills or other anticipated releases of hazardous substances to the environment are not considered to be significant.

Assuming that the recommended mitigations to protect water quality are applied in conjunction with approval of the proposed MPO, several beneficial effects would occur. These beneficial effects are summarized as follows:

- Water quality in the pit lake would be required to meet applicable water quality standards, and a pit lake water quality management plan, contingency water treatment plan, and a long-term financial assurance (e.g., a trust fund) would be established in accordance with BLM regulations at 43 CFR 3809.552(c) to provide funding to implement the pit lake water quality management plan and to provide for treatment of the water if necessary. This would result in an improvement in the water quality measurement indicator for the pit lake from 4 to 5 (the existing condition) to zero (the anticipated future condition assuming the recommend mitigations are applied and are effective).
- The existing TSF would be modernized with placement of a low-permeability liner, which would cover existing tailings and mitigate potential future discharges of MIW from the existing TSF. This would result in an improvement in the water quality measurement indicator for groundwater downgradient from the TSF from 1 (the existing condition) to 0 (the anticipated future condition assuming that natural attenuation processes mitigate the existing TDS contamination in the years after the low permeability liner is installed).
- The waste rock dumps would be reclaimed in a manner that meets modern requirements for groundwater quality protection at the State level (e.g., placement of a 36-inch soil cover) and meets current BLM requirements for environmental protections as set forth in the 43 CFR 3809 regulations. This would decrease the risk that ARD or other deleterious leachate would be discharged from the existing waste rock dumps in the future.

3.4.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The following sections address anticipated water quality effects with respect to the pit lake, ephemeral surface water, and groundwater for Alternative 1.

Pit Lake Water Quality: Direct and indirect effects associated with pit lake water quality are expected to be approximately the same for Alternative 1 as discussed for the Proposed Action. Alternative 1 would reduce the mine life from 16 years to 11 years, which would reduce the length of time that sulfide minerals are exposed in the pit floor and mine highwalls. This would reduce the risk of adverse effects to water quality as compared to the Proposed Action. However, due to complexities related to the prediction of water quality effects that would result from interactions between the sulfide minerals and pit water (see also Section 3.4.2.1), this relative reduction in the potential for adverse effects to water quality cannot be quantified. If no mitigations are applied to address future pit water quality, the pit lake water quality measurement indicator would be expected to range from 4 to 5, which is the same as the pit lake water quality measurement indicator for the Proposed Action.

The recommended mitigations discussed for the Proposed Action are also recommended for Alternative 1. Assuming that these mitigations are implemented and effective, the expected value of the water quality measurement indicator for the pit lake would approach zero, and the pit lake would be expected to meet applicable water quality standards and designated uses. This would be an improvement as compared to existing conditions, because the value of the pit lake water quality measurement indicator for the existing condition is 4.

Assuming the recommended mitigations are implemented and effective, likely effects to pit lake water quality associated with Alternative 1 are also classified as not significant.

Surface Water and Groundwater Quality: Under Alternative 1, the mineral processing rate would be 25,000 tpd rather than 17,500 tpd as included in the Proposed Action. This would increase the rate of production of waste rock, both low-grade and ore, but the overall tons of rock produced would be the same as the Proposed Action. This increase in the production rate would decrease the mine life to approximately 11 years, because the available ore would be mined faster under Alternative 1. This would lead to some beneficial effects to water quality as compared to the Proposed Action, because the waste rock and low-grade stockpiles would be reclaimed approximately 11 years after mining commences rather than approximately 16 years after mining commences. Other aspects of the project associated with water quality would be the same as included in the Proposed Action. The relative benefits to water quality associated with Alternative 1 as compared to the Proposed Action cannot be quantified at the scale of the water quality measurement indicators, and therefore, the values of the measurement indicators developed for the Proposed Action also apply to Alternative 1.

It is recommended that the same mitigations to protect water quality recommended for the Proposed Action also be applied to Alternative 1, if selected. Assuming that these mitigations are applied, the significance of the effects to water quality for Alternative 1 would be the same as described for the Proposed Action.

3.4.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The following sections address anticipated water quality effects with respect to the pit lake, ephemeral surface water, and groundwater for Alternative 2.

Pit Lake Water Quality: Under Alternative 2, the ultimate pit would encompass approximately 161 acres, which is larger than the ultimate pit proposed for the Proposed Action and Alternative 1. The relatively larger size of the pit would result in a somewhat larger pit lake with relatively more surface area available for evaporation. This may affect the rate of evapoconcentration of dissolved solids within the water, but the associated effects on pit lake water quality are expected to be negligible when considered in relation to the measurement indicators and the inherent uncertainty of the pit lake model. The estimated mine life for Alternative 2 is approximately 11 years, which is 5 years shorter than the estimated mine life for the Proposed Action.

Alternative 2 would provide for production of approximately 125 million tons of ore, which is approximately 25 percent more ore than would be produced under the Proposed Action or Alternative 1. The production rate would increase to approximately 30,000 tpd, which would provide for a mine life of approximately 11 years. Alternative 2 would provide for mining and processing of a larger proportion of the ore body. This may result in exposure of rocks in the final pit highwalls that contain a relatively lower proportion of sulfide minerals as compared to the Proposed Action or Alternative 1, because the known ore deposit would be more completely mined. Therefore, Alternative 2 would have a relatively lower potential to cause adverse water quality affects as compared to the Proposed Action or Alternative 1. However, due to complexities related to the prediction of water quality effects that would result from interactions between the sulfide minerals and pit water (see also Section 3.4.2.1), this relatively lower risk of adverse water quality effects cannot be quantified, and the measurement indicators discussed for the Proposed Action would remain the same. Accordingly, if no mitigations were applied, the measurement indicator for pit lake water quality would be expected to range from 4 to 5.

The mitigations recommended for the Proposed Action are also recommended for Alternative 2. If these mitigations are implemented and are effective, the estimated value of the pit lake water quality measurement indicator for Alternative 2 would be zero, which would be an improvement in pit lake water quality as compared to current conditions. Assuming the recommend mitigations are implemented, the likely effects to pit lake water quality associated with Alternative 2 are also would not be classified as significant.

Surface Water and Groundwater Quality: Although the total tonnage of ore produced under Alternative 2 would be higher than Alternative 1, the proposed tonnage of waste rock produced would be relatively lower. Under Alternative 2, 36 million tons of waste rock and low-grade ore would be produced, whereas approximately 63 million tons of low-grade ore and waste rock would be produced under the Proposed Action and Alternative 1. Therefore, potential adverse effects of the WRDFs would be somewhat lower for Alternative 2 as compared to the Proposed Action or Alternative 1. Other aspects of Alternative 2 that are relevant to water quality would be the same as included in the Proposed Action.

Although Alternative 2 would be relatively more protective of water quality as compared to the Proposed Action or Alternative 1, these relative effects cannot be quantified at the scale of the water quality measurement indicators. The values of the measurement indicators and the anticipated level of significance of the effects to water quality would be the same as described for the Proposed Action.

3.4.2.4 No Action Alternative

The environmental effects of the No Action Alternative are addressed to provide a baseline for evaluation of effects associated with the action alternatives. Under the No Action Alternative, the proposed MPO would not be approved, and the existing conditions and resulting effects to water quality described in Section 3.4.1 would persist on the site. No additional mining, mitigation of existing water quality issues, or reclamation of the mine would occur.

If any of the action alternatives are selected, additional mining would occur in accordance with modern mining regulations including BLM regulations at 43 CFR 3809. Current regulations for environmental protection during mining, reclamation of disturbed areas, and post-closure site management are more stringent than the regulations that applied in the 1980s during the Quintana mining operations at the site. The beneficial effects that would occur under the Proposed Action and action alternatives would not occur under the No Action Alternative.

3.4.3 Mitigation Measures

Mitigation measures for water quality are described within the subsections of 3.4.2 for the Proposed Action and each alternative.

3.5 SURFACE WATER USE

3.5.1 Affected Environment

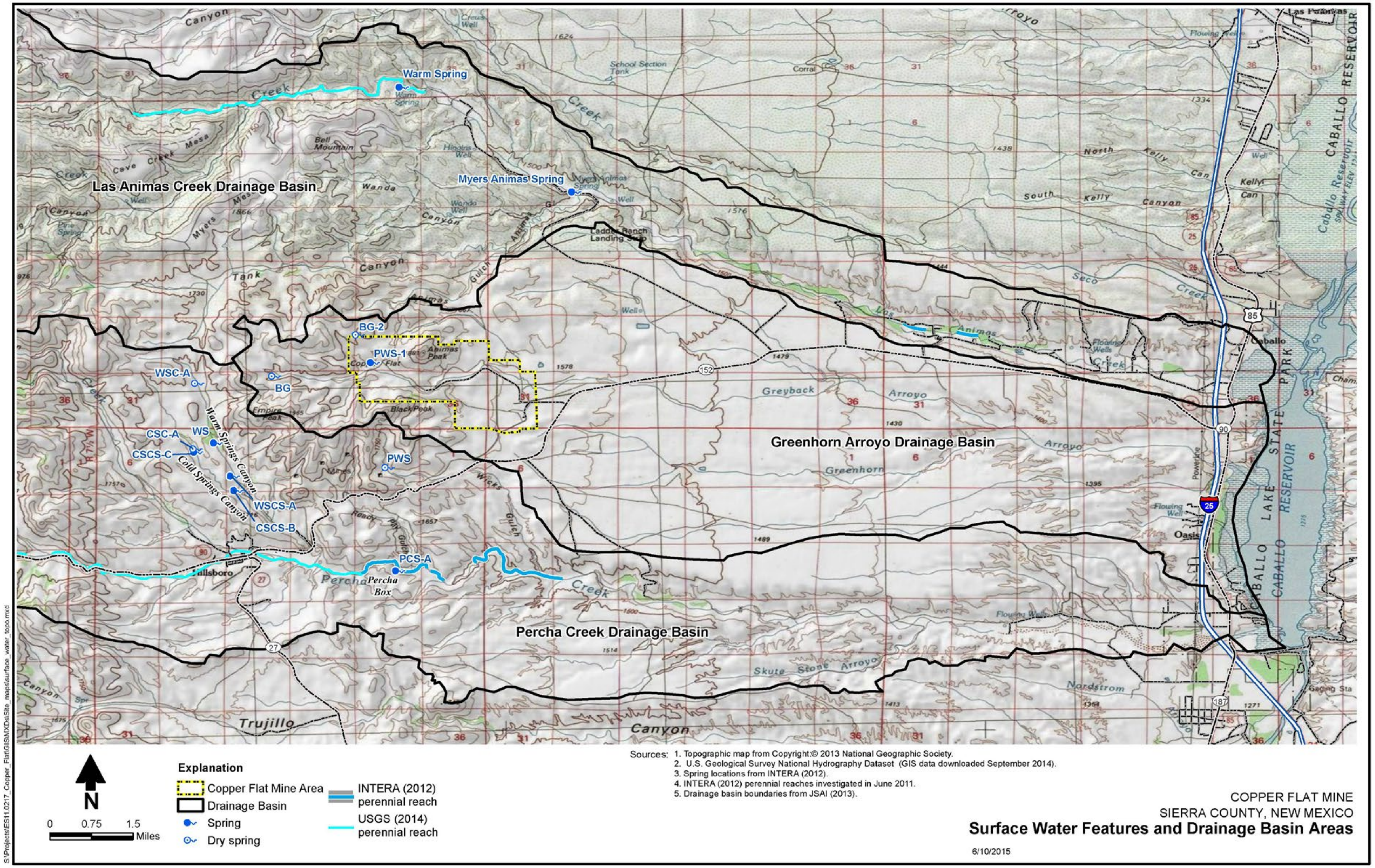
The Copper Flat mine area is within the Creosote Rolling Upland and Grass Mountain of southern New Mexico, a warm arid region where annual evaporation greatly exceeds annual precipitation. Precipitation generally comes in the form of local, high-intensity summer (July through September) rain showers. These storms are typically of short duration. Annual precipitation in the area of Copper Flat ranges from 5 to 20 inches per year, averaging approximately 13 inches per year (JSAI 2013b). Daily precipitation of 1 inch or more occurs twice per year on average, with daily storm events of greater than 2 inches expected about every 5 years (JSAI 2013b). The 100-year 24-hour storm event is about 3.6 inches (NOAA 2014).

Within the project area, estimated annual potential ET, which includes evaporation and plant transpiration, ranges from 60 to 65 inches per year (JSAI 2013b). Actual ET is less and depends on water availability and climatic conditions such as temperature, sun, and wind exposure. Evaporation from the Copper Flat pit lake is approximately 65 inches per year (JSAI 2013b).

The Copper Flat project area lies within the Lower Rio Grande watershed of south-central New Mexico. This approximately 5,000-square-mile watershed extends from the Elephant Butte reservoir to the junction of the Mexico, New Mexico, and Texas international boundary (USGS 2014). The watershed is dominated by the Rio Grande and the Elephant Butte and Caballo Reservoirs, which lie along the river. Caballo Reservoir, located at the eastern margin of the proposed project area, is an earthen dam reservoir constructed in the late 1930s. The estimated storage capacity of the reservoir is 227,000 AF (USBR 2015a). The average volume of water stored in the reservoir between January 1 and June 9, 2015 was 36,715 AF (USBR 2015b), approximately 16 percent of the total capacity.

Headwaters to the Rio Grande are fed by the Rocky Mountains in Colorado. Numerous tributary drainages within the Lower Rio Grande watershed also contribute water to the Rio Grande. However, none of these drainages provide perennial flow; they contribute flow primarily during storm events.
The mine area is located within the Greenhorn Arroyo drainage basin, a topographic basin within the Lower Rio Grande watershed. This basin contains small, ephemeral washes (arroyos) that drain generally from west to east toward Caballo Reservoir; major washes include the Greyback and Greenhorn arroyos. Surface water runoff at Copper Flat is generated predominantly by precipitation at higher elevations (Davie and Spiegel 1967). The Percha Creek and Las Animas Creek topographic drainage basins are located immediately south and north, respectively, of the Greenhorn Arroyo drainage basin. Both Percha Creek and Las Animas Creek flow from west to east toward Caballo Reservoir and have ephemeral, intermittent, and perennial reaches. Three drainage basins and their associated surface water features are located in the area of the Copper Flat mine. (See Figure 3-5.)

Figure 3-5. Surface Water Features and Drainage Basin Areas



Source: NGS 2013; USGS 2014; INTERA 2012; JSAI 2013.

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The following subsections provide a description of each of the three drainage basins based on information documented in existing reports. These reports include recent baseline characterization and groundwater supply and modeling studies (Intera 2012; JSAI 2012 and 2013), a previous EIS (BLM 1999), and other historical documents (Davie and Spiegel 1967; Newcomer 1998).

3.5.1.1 Greenhorn Arroyo Drainage Basin

The Copper Flat mine area lies within the Greenhorn Arroyo drainage basin. The area of this drainage basin is approximately 35,000 acres, including a 230-acre watershed that drains to the existing open pit (JSAI 2013). Current surface water uses within this basin are primarily livestock watering.

Major washes within the Greenhorn Arroyo drainage basin include the Greenhorn and Greyback Arroyos. (See Figure 3-5.) Several smaller arroyos are tributaries to these two larger arroyos, which drain to the east and converge approximately 8 miles east of the Copper Flat mine. The Greyback Arroyo is the predominant surface water drainage feature in the area of the mine. It originates west of the mine and was rerouted around the southern perimeter of the mine area during the earlier mining activities in the 1980s. Before mining in the 1980s, the Greyback Arroyo ran directly through the current mine area. The Greenhorn Arroyo is located south of the Greyback Arroyo.

From August 2010 through April 2011, stormwater flows were monitored at three locations along Greyback Arroyo within the proposed mine area as part of the baseline characterization study (Intera 2012). Stormwater flows during this period were minimal, with dry conditions often observed. In March 1993, Newcomer et al. (1993) (as cited in Intera 2012) recorded a surface water flow rate of 0.028 cubic feet per second (cfs) (20 AFY) in the Greyback Arroyo east of the former plant area.

Springs and seeps have been identified within the Greenhorn Arroyo drainage basin (Newcomer 1993; BLM 1999; Intera 2012). The baseline characterization study monitored springs located north and west of the open pit and identified several seeps emanating from the fractured bedrock of the open pit highwalls shortly after precipitation events. (See Figure 3-5.) Flow rates at these features were minimal; the springs were dry, and pit wall seepage was too low to accurately measure flow during routine monitoring events (Intera 2012). Previously reported seeps and springs (BLM 1999; Newcomer et al. 1993) were dry during the baseline characterization study. Below average precipitation during the period of the baseline characterization study was likely a factor in the low flow rates and dry conditions observed at the springs and seeps. Precipitation recorded at the mine between October 2010 and September 2011 was 4.82 inches.

The existing open pit has filled with water to form a small pit lake. The pit lake covers approximately 5.2 acres and holds approximately 60 AF of water (Intera 2012). The water level at the pit lake is influenced by several factors, including the following:

- Stormwater runoff to the open pit;
- Groundwater inflow from the adjacent saturated bedrock; and
- Evaporation from the lake surface.

3.5.1.2 Las Animas Creek Drainage Basin

The Las Animas Creek drainage basin is adjacent to and north of the Greenhorn Arroyo drainage basin. The basin is approximately 84,000 acres (JSAI 2013) and is drained by Las Animas Creek. (See Figure 3-5.) This creek originates in the Black Range Mountains west of the project area and flows to the east toward Caballo Reservoir – a distance of approximately 32 miles. Like other drainages in the region, Las Animas Creek is deeply incised into an east-sloping alluvial plain. Springs have been identified within

Las Animas Creek basin (Davie and Spiegel 1967). Several are present along Las Animas Creek, including Warm and Myers Animas springs.

Surface water flow characteristics in Las Animas Creek vary; the creek has ephemeral, intermittent, and perennial reaches. Las Animas Creek does not contribute perennial surface water flow to the Rio Grande. Surface water flow rates were measured in August 2010, November 2010, January 2011, and April 2011 along Las Animas Creek and ranged from 0.04 to 7.09 cfs (30 to 5,140 AFY) (Intera 2012). The greatest flow rates were generally recorded just downstream of Warm Spring in August, when precipitation was higher. During the period of the baseline characterization study, two short perennial reaches located 4 to 6 miles west of Caballo Reservoir were monitored, and Las Animas Creek was predominantly a losing stream (Intera 2012). (See Figure 3-5.) Historical surface water flow rates of Las Animas Creek range from less than 1 to 60.3 cfs (700 to 43,700 AFY) (Davie and Spiegel 1967; ABC 1998). The higher flow rates are most likely associated with snowmelt and late summer precipitation.

From 2010 and 2011, the flow rate at Warm Spring was nearly constant, ranging from approximately 0.73 to 1.1 cfs (530 to 800 AFY) (Intera 2012). Historical flow rate measurements vary from 0.007 cfs (5 AFY) (Newcomer 1993) to 0.81 cfs (590 AFY) (Davie and Spiegel 1967). A second, unnamed spring was identified during the 2010-2011 baseline characterization study (Intera 2012). This spring is located 3 miles downstream of Warm Spring and is designated as Myers Animas Spring on U.S. Geological Survey (USGS) topographic maps.

The Ladder Ranch uses water from the upper portion of Las Animas Creek basin for irrigation and to fill stock ponds (Intera 2012). This includes both surface water from Las Animas Creek and groundwater pumped from the shallow alluvium. Local residents use water resources in the lower portion of Las Animas Creek basin for agricultural and domestic purposes. A number of diversion ditches and return flow ditches exist along the lower portion of Las Animas Creek. In addition, many residents have shallow wells (NM OSE 2014), some of which are artesian. The use of diversion ditches and shallow wells along Las Animas Creek causes local and seasonal changes in alluvial groundwater levels and surface water flows (Davie and Spiegel 1967; Intera 2012).

3.5.1.3 Percha Creek Drainage Basin

The Percha Creek drainage basin encompasses approximately 77,000 acres (JSAI 2013), and is located immediately south of the Greenhorn Arroyo basin. The basin is drained by Percha Creek, which originates in the Black Range Mountains and flows to the east toward Caballo Reservoir. (See Figure 3-5.) Surface water flow characteristics in Percha Creek vary, but are considered intermittent in many reaches (BLM 1999). Percha Creek is intermittent in the area of Hillsboro and perennial east of Hillsboro in an area known as the Percha Box, a steep-walled reach of the creek that is incised into Paleozoic carbonate rocks (BLM 1999). (See Figure 3-5.) The creek is perennial through the box due to its geological structure. Downstream of the Percha Box, the creek is ephemeral, as the surface geology changes from carbonate rocks to alluvial sands and gravels. At the east end of the creek, artesian groundwater conditions create local springs and flowing wells near Caballo Reservoir (BLM 1999). Percha Creek does not contribute perennial flow to the Rio Grande.

Between 2010 and 2011, surface water flow rates along perennial reaches of Percha Creek ranged from 0.002 to 7.45 cfs (1 to 5,400 AFY) (Intera 2012). The highest surface water flow rates were recorded in August, when precipitation was higher. Three separate perennial reaches were observed in the area of and immediately downgradient of the Percha Box. (See Figure 3-5.) The reaches range from approximately 0.2 mile to 2 miles in length (Intera 2012). During the period of the baseline characterization study, the creek exhibited both losing and gaining reaches, with surface water flow decreasing significantly downstream of the Percha Box, eventually disappearing as the creek enters the Tertiary Palomas Basin alluvial gravels and sands. Earlier surface water investigations report perennial flow characteristics in the area of the Percha Box, with measurable flow rates ranging from approximately 0.3 to 1 cfs (200 to 700 AFY) (SRK 1995; ABC 1996).

Several springs have been identified in the Percha Creek drainage basin (Intera 2012). Springs exist in Warm Springs and Cold Springs canyons and the Percha Box. (See Figure 3-5.) Warm Springs and Cold Springs canyons are tributary drainages to Percha Creek and are located northwest of the Percha Box. Between 2010 and 2011, surface water flow rates at springs in these canyons ranged from 0 cfs (0 AFY) (i.e., stagnant water or dry conditions) to 0.75 cfs (540 AFY), with the highest flow rates recorded in August (Intera 2012). The flow rate at a spring monitored within the Percha Box was nearly constant, ranging from 0.41 to 0.64 cfs (300 to 460 AFY) (Intera 2012), and exhibited little seasonal variability. Springs are also present at the eastern terminus of Percha Creek.

Water resources within the Percha Creek drainage basin are used for domestic purposes, livestock, and irrigation (Intera 2012). Many of the residents of Hillsboro and the surrounding area have shallow alluvial wells (NM OSE 2014). Some residents also divert surface water for irrigation. Ranches east of Hillsboro obtain stock water from shallow alluvial wells or diversion ditches when surface water is available. The shallow wells are generally located in the alluvium along Percha Creek.

3.5.2 Environmental Effects

The following subsections discuss expected environmental effects associated with the Proposed Action and alternatives, including the No Action Alternative. The evaluation of environmental effects is based primarily on predictive groundwater flow modeling. JSAI (2013 and 2014) developed a calibrated numerical groundwater flow model of the Copper Flat area that simulates groundwater/surface water interactions along portions of Las Animas and Percha Creeks and the Rio Grande upstream and downstream of Caballo Dam. Pit dewatering is also considered in the model simulations. This model was used to predict impacts to surface water resources caused by groundwater pumping associated with the proposed operation of the Copper Flat mine (JSAI 2014a and 2014b). These impacts consist of a reduction in groundwater discharge to Las Animas Creek, Percha Creek, and the Rio Grande, including Caballo Reservoir. Tables 3-15 and 3-16 summarize expected surface water depletions due to predicted reductions in groundwater discharge. Reductions in groundwater discharge to these surface water features were estimated by comparing groundwater modeling simulation results for the Proposed Action and two mining alternatives to simulation results without mining; the simulation without mining is intended to represent background conditions (JSAI 2014).

Operational information presented in the MPO (THEMAC 2012) was also evaluated to assess potential impacts from stormwater management at the mine. Stormwater at the mine would be managed in accordance with a SWPPP. In New Mexico, industrial facilities can apply for stormwater permit coverage under the State-wide general permit NMR050000 issued by the USEPA (NMED 2014a).

Table 3-15. Predicted Surface Water Depletion Rates at End of Mining and 100 Years After Closure Due to the Proposed Action and Two Mining Alternatives

Table 3-15. Predicted Surface Water Depletion Rates at End of Mining and 100 Years After Closure Due to the Proposed Action and Two Mining Alternatives

Surface Water Feature	Rate (AFY)					
	Proposed Action		Alternative 1		Alternative 2	
	End of Mining	Closure	End of Mining	Closure	End of Mining	Closure
Caballo Reservoir (upstream of dam)	807	24	939	22	1,093	25
Rio Grande (downstream of dam)	657	3	803	3	932	3
Las Animas Creek [1]	12	1	14	1	17	1
Percha Creek [1]	18	3	20	3	24	4

Notes: Predicted surface water depletion rates provided by JSAI (2014a and 2014b). End of mining values represent maximum depletion rates, which occur 3 months after the cessation of mining. Closure values are for 100 years after mining.

[1] Predicted surface water depletion rates of Las Animas and Percha Creeks include water available for surface water flows and ET.

Table 3-16. Predicted Cumulative Surface Water Depletion Volumes Due to the Proposed Action and Two Mining Alternatives

Table 3-16. Predicted Cumulative Surface Water Depletion Volumes Due to the Proposed Action and Two Mining Alternatives

Surface Water Feature	Volume (AF)		
	Proposed Action	Alternative 1	Alternative 2
Caballo Reservoir (upstream of dam)	8,845	6,934	8,353
Rio Grande (downstream of dam)	7,106	5,553	6,730
Las Animas Creek [1]	140	113	136
Percha Creek [1]	178	134	165

Note: Predicted cumulative surface water depletion volumes at 3 months post mining.

[1] Predicted surface water depletion rates of Las Animas and Percha Creeks include water available for surface water flows and ET.

3.5.2.1 Proposed Action

The Proposed Action is expected to result in significant impacts, with long-term minor to moderate adverse effects. The Proposed Action, to process ore at a nominal throughput of 17,500 tpd, is predicted to reduce groundwater discharge to Las Animas and Percha Creeks, Caballo Reservoir, and Rio Grande below Caballo Dam, decreasing the amount of water available for surface water flow and plant evapotranspiration. The predicted depletions are not expected to have substantial impacts to the surface water flow characteristics at or vegetation along Las Animas and Percha Creeks; the reductions are relatively small and the majority of the creeks' reaches within the Palomas basin, where most of the depletions occur, are ephemeral. However, the predicted reductions in groundwater discharge are expected to have a more notable effect on the Rio Grande, reducing surface water flows and potentially the amount of water stored behind Caballo Reservoir. Tables 3-15 and 3-16 report predicted depletions rates and cumulative depletion volumes, respectively, at the surface water features at the end of mining.

Except for springs located in the immediate vicinity of the open pit, impacts to springs located west of the Animas Uplift (e.g., Warm Springs) are not expected based on predicted drawdown of the groundwater flow model. Some of the bedrock seeps and springs in the immediate vicinity of and at the open pit could be impacted, possibly going dry during mining operations as the open pit is dewatered; however, bedrock seeps at the open pit that only flow in response to precipitation events are not expected to be impacted by mining operations. In addition, flow rates at springs located at the eastern terminus of Percha Creek may decline due to anticipated drawdown and reduced hydrostatic pressure in this area from pumping at the well field.

Stormwater management at the mine is not expected to have a substantial effect on surface water quantities in the Greyback and Greenhorn Arroyos. Proposed mining operations and the expansion of the open pit would not alter the existing Greyback diversion channel; stormwater flows captured in the Greyback Arroyo upgradient of mine facilities would continue to be diverted around the mine. In addition, to the extent practical, stormwater would be directed away from mine-impacted areas and allowed to follow natural drainage paths. Stormwater that does come in contact with mine-impacted areas would be captured and used as process water; stormwater harvesting from mine facilities is estimated to be approximately 304 AFY. (See Table 3-17.)

Table 3-17. Summary of Water Supply Sources and Contributions

Table 3-17. Summary of Water Supply Sources and Contributions			
	Contribution (AFY)		
Source	**Proposed Action**	**Alternative 1**	**Alternative 2**
Well field	3,802	5,290	6,105
Stormwater	304	306	304
Moisture in ore	129	194	258
Pit dewatering	39	39	39
Total	**4,274**	**5,829**	**6,706**

3.5.2.1.1 Mine Development and Operation

Water would be used during operation of the mine for ore processing, dust suppression, and other activities. Ore processing would require about 93 to 96 percent of the water used. The majority, approximately 70 percent, of the water used by the mine would be recycled. The remaining 30 percent would be consumed primarily through evaporation, retention in tailings and mineral concentrate, and dust suppression applications, and would need to be replaced. The Proposed Action would consume approximately 4,274 AFY of water. (See Table 3-17.)

The majority (89 percent) of the water consumed would be replaced by groundwater pumped from the well field located approximately 8 miles east of the Copper Flat mine. Other sources of water would include stormwater captured at mine facilities, pit dewatering water, and moisture present in the ore. The contribution from each source for the Proposed Action and two mining alternatives is summarized above. (See Table 3-17.)

The pumping of groundwater at the open pit and well field would affect existing surface water conditions in the Greenhorn Arroyo, Las Animas Creek, and Percha Creek drainage basins. A 5.2-acre lake currently exists within the open pit. During mining operations, this pit lake would be pumped down, and the open pit would be continually dewatered to facilitate safe mining operations. The existing pit lake would be reduced to a much smaller operational sump, where water flowing into the pit would be managed. Sources of water to the open pit would include groundwater inflow and stormwater runoff. Water removed from the open pit would be used for dust suppression on roads. (See Table 3-17.)

Pumping of groundwater from the well field is expected to minimally reduce groundwater discharge to both Las Animas and Percha Creeks, resulting in a slight decrease in the amount of water available for perennial surface water flow and plant ET. Under the Proposed Action, maximum depletion rates of 12 and 18 AFY are predicted for Las Animas Creek and Percha Creek, respectively, at shortly after the end of mining. (See Table 3-15.) The majority of the impacts from the Proposed Action would be to the lower portions of the creeks (i.e., within the Palomas Basin). Estimated existing flow and ET rates to lower portions of Las Animas and Percha Creeks are 4,848 and 2,630 AFY, respectively (See Table 3-20a); therefore, the predicted maximum depletions reduce groundwater discharge rates by only 0.3 and 1.0 percent, respectively. These small reductions are not expected to have substantial impacts on vegetation or surface water flows, as the majority of the creeks' reaches within the Palomas Basin are ephemeral.

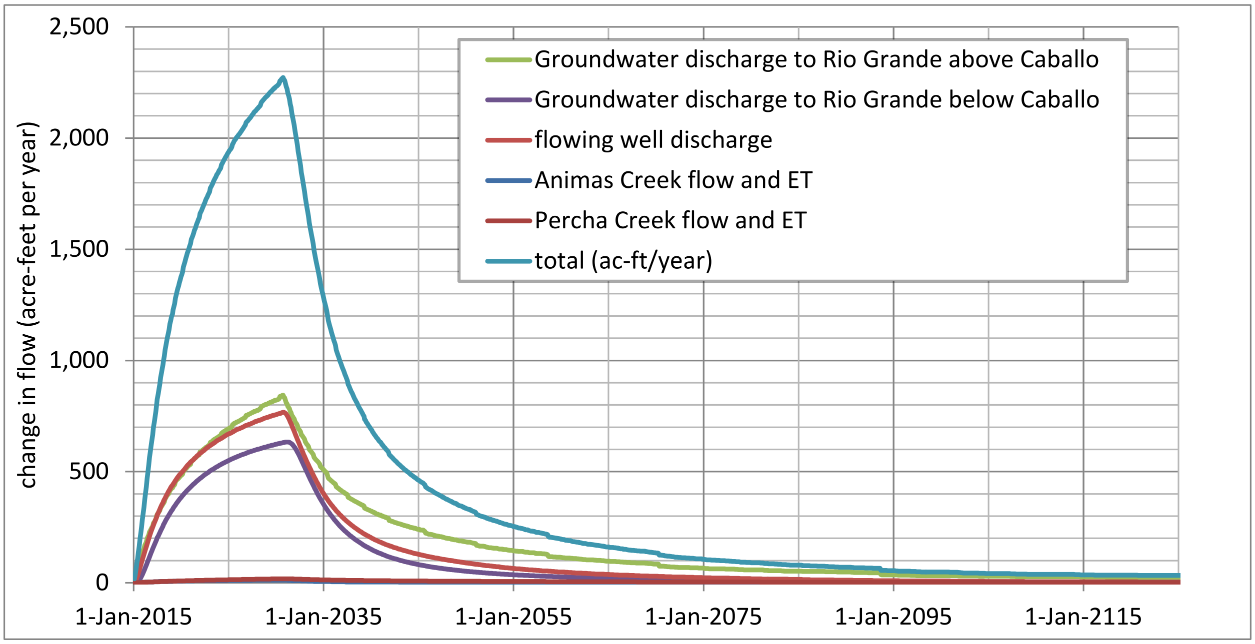
Predicted maximum depletions for the Proposed Action to upper Las Animas Creek and at the Percha Box are 1 to 2 AFY. These depletions are not expected to impact Warm Springs or any springs west of the Animas Uplift based on predictions of where drawdown is simulated. Springs along the alluvial valleys are considered perched discharges and not directly connected to regional groundwater. Bedrock seeps in the immediate area of the mine could be impacted and possibly go dry.

Predicted maximum depletion rates at Caballo Reservoir and Rio Grande below Caballo Dam are 807 and 657 AFY, respectively (JSAI 2012). (See Table 3-15.) These maximum depletion rates occur shortly after the end of mining. The total predicted maximum depletion rate (1,464 AFY) is 12 percent of the estimated groundwater discharge rate (11,795 AFY [JSAI 2014]) from the Copper Flat mine study area to the Rio Grande and Caballo Reservoir. This would likely reduce surface water flows in the Rio Grande and potentially the amount of water stored behind the Caballo Reservoir.

Changes in water balance components are anticipated due to groundwater pumping associated with the mine, including depletions at Caballo Reservoir, the Rio Grande, and Las Animas and Percha Creeks. (See Figure 3-6.) The depletions steadily increase during mining, peak at the end of mining, and then decline once mining ceases.

Mining and concentrating operations would not discharge to surface water courses in the Greenhorn Arroyo drainage basin, such as the Greyback and Greenhorn Arroyos. Stormwater runoff from mine facilities would be captured in settling ponds and used as process water. This is expected to supply approximately 304 AFY of water. (See Table 3-17.) NMCC would use diversions, berms, and other BMPs to prevent stormwater from areas outside the mine from running on to mine areas and facilities.

Figure 3-6. Change in Water Balance Components Due to Proposed Action



Source: JSAI, 2015.

Note: the term "flowing wells" is equivalent to the term "artesian wells."

<u>3.5.2.1.2 Mine Closure/Reclamation</u>

The Copper Flat mine would be reclaimed to conditions similar to those present before the reestablishment of mining. The objective of the reclamation plan is to achieve a self-sustaining ecosystem without the need for perpetual care. Reclamation and revegetation of mine areas and facilities would stabilize exposed soil, minimizing erosion and contributions of suspended solids to surface water courses. Disturbed areas would be regraded to blend in with the surrounding topography as much as practicable. Drainage channels, ditches, and earthen water control structures would be revegetated and protected from erosion by riprap, sediment traps, or other types of BMPs.

The existing Greyback diversion channel would be left in place at closure and would continue to divert stormwater flows around the southern perimeter of the mine area. In addition, stormwater diversions at the waste rock disposal areas would remain, and if necessary, be lined with riprap to prevent erosion. The mine would attempt to maintain the existing riparian area located in the Greyback Wash east of the mine area during both mine operations and at closure.

Dewatering of the open pit would cease at closure. Groundwater inflow and stormwater runoff from within the perimeter of the pit would begin to form a pit lake. The expected size of the pit lake after mining would be larger than the existing one, as mining would expand the area and depth of the open pit. The pit lake is expected to eventually cover 18.6 surface acres and be approximately 200 feet deep. The size of the lake would fluctuate annually and seasonally depending on climatic conditions, such as precipitation and air temperature. The estimated maximum water loss from the pit lake would be about 100 AFY, assuming an average evaporation rate of 65 inches per year.

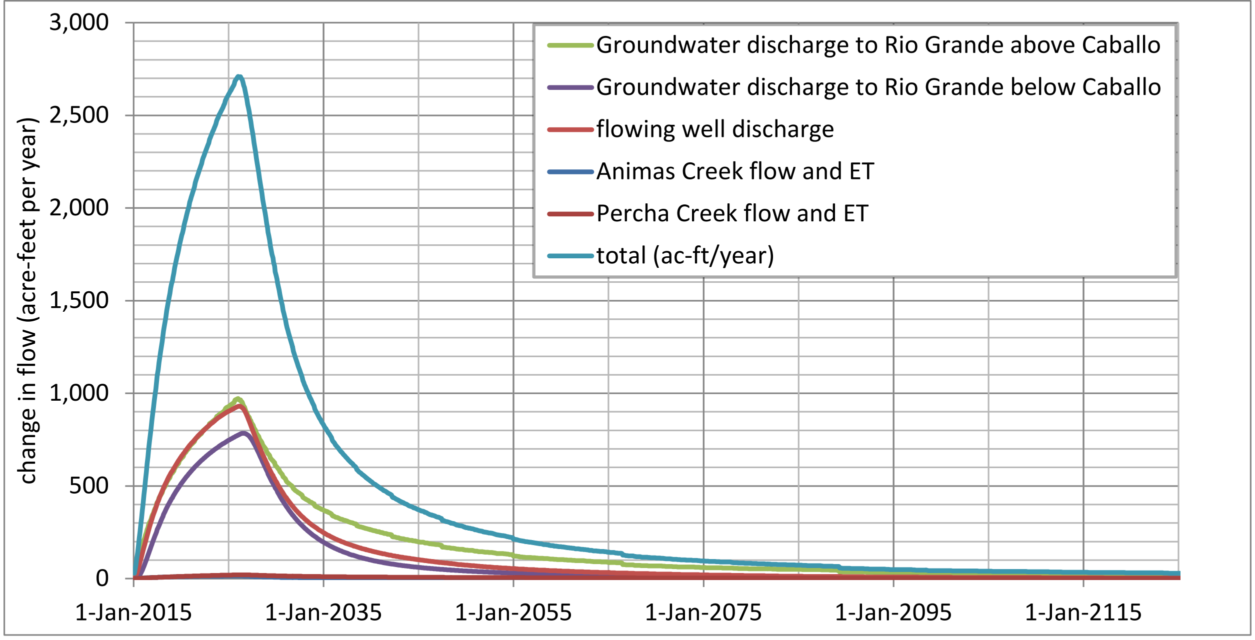
Once mining stops and water is no longer needed for mineral beneficiation and other mining activities, pumping of groundwater from the supply wells located east of the mine would stop. Consequently, groundwater levels of the Santa Fe Group aquifer are expected to rebound, stream depletion rates would decline, and depletions themselves would slow. (See Table 3-16 and Figure 3-6.)

3.5.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The effects from mine development, operation, closure, and reclamation under Alternative 1 would be similar in nature to those outlined under the Proposed Action -- that is, significant impacts, with long-term minor to moderate adverse effects. However, predicted reductions in groundwater discharge to surface water resources and resultant depletions to surface water flows and volumes would be different. (See Tables 3-15 and 3-16.) Alternative 1 would consume approximately 5,829 AFY of water; approximately 5,290 AFY (91 percent) would be supplied from the well field. (See Table 3-17.)

Alternative 1 is predicted to result in greater surface water depletion rates than the Proposed Action due to its increased groundwater demand. (See Table 3-15.) However, cumulative depletion volumes would be less than the Proposed Action due to the shorter mine life. (See Table 3-16.) Predicted maximum depletion rates at Las Animas and Percha Creeks are 14 and 20 AFY, respectively; predicted maximum depletion rates at Caballo Reservoir and the Rio Grande below Caballo Dam are 939 and 803 AFY, respectively. (See Table 3-15.) These predicted maximum depletion rates represent 0.3, 0.8, and 14.8 percent reductions in groundwater discharge to Las Animas Creek, Percha Creek, and the Rio Grande and Caballo Reservoir, respectively. Expected surface water depletions are associated with Alternative 1. (See Figure 3-7.) Once mining and associated pumping of groundwater from the supply well field stops, surface water depletions are predicted to decline. Except for Caballo Reservoir, depletions at 100 years after closure are predicted to be approximately 3 AFY or less. (See Table 3-15.) The predicted depletion at Caballo Reservoir at 100 years after closure is 22 AFY.

Figure 3-7. Change in Water Balance Components Due to Alternative 1



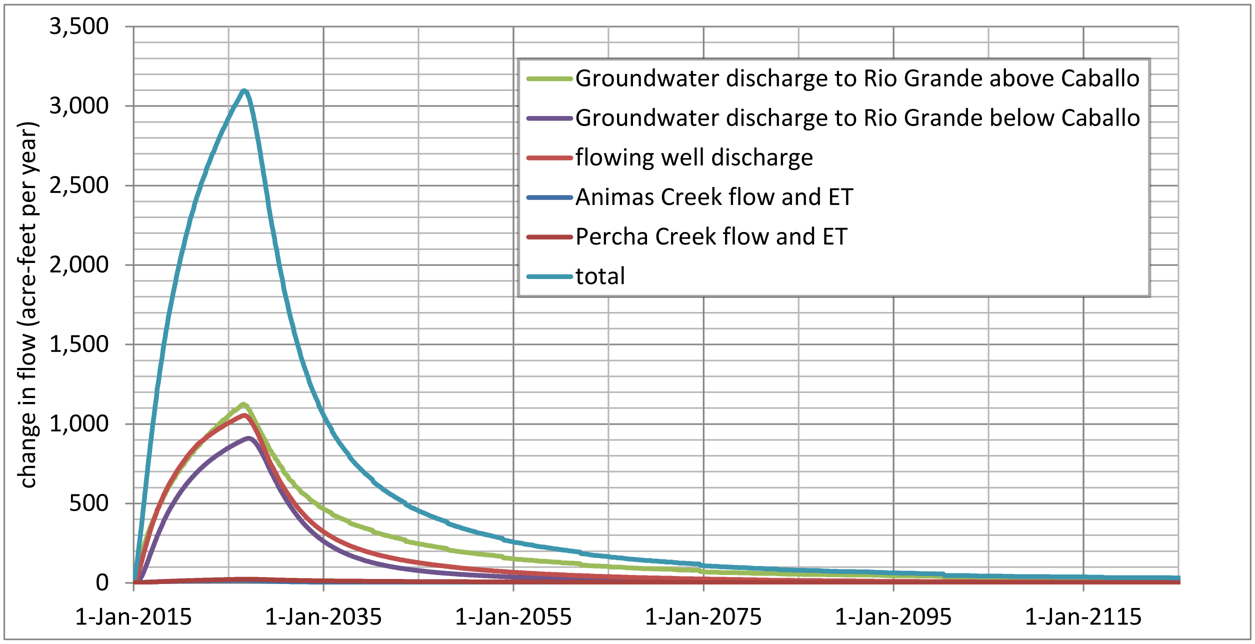
Source: JSAI 2015.

3.5.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The effects from mine development, operation, closure, and reclamation under Alternative 2 would be similar in nature to those outlined under the Proposed Action -- that is, there would be significant impacts, with long-term minor to moderate adverse effects. However, predicted reductions in groundwater discharge to surface water resources and resultant depletions to surface water flows and volumes would be different. (See Tables 3-15 and 3-16.) Alternative 2 would consume approximately 6,706 AFY of water; approximately 6,105 AFY (91 percent) would be supplied from the well field. (See Table 3-17.)

Alternative 2 is predicted to result in greater surface water depletion rates than both the Proposed Action and Alternative 1 due to its greater groundwater demand. (See Table 3-15.) However, cumulative depletion volumes would be lower than the Proposed Action due to the shorter mine life. (See Table 3-16.) Predicted maximum depletion rates at Las Animas and Percha Creeks are 17 and 24 AFY, respectively; predicted maximum depletions at Caballo Reservoir and the Rio Grande below Caballo Dam are 1,093 and 932 AFY, respectively. (See Table 3-15.) These predicted maximum depletion rates represent 0.4, 0.9, and 17.7 percent reductions in groundwater discharge to Las Animas Creek, Percha Creek, and the Rio Grande and Caballo Reservoir, respectively. Figure 3-8 shows expected surface water depletions associated with Alternative 2. (See Figure 3-8.) Once mining and the pumping of groundwater from the supply well field stops, surface water depletions are predicted to decline, similar to the Proposed Action and Alternative 1. Depletions at 100 years after closure are predicted to be approximately 4 AFY or less, except for at Caballo Reservoir, where the predicted depletion is 25 AFY. (See Table 3-15.)

Figure 3-8. Change in Water Balance Components Due to Alternative 2



Source: JSAI 2015.

3.5.2.4 No Action Alternative

The No Action Alternative would avoid potential reductions in groundwater discharge to surface water resources and resultant surface water depletions at the Rio Grande, including Caballo Reservoir, and at Las Animas and Percha Creeks.

In addition, the No Action Alternative would avoid changes to existing hydrologic conditions at the open pit. These changes include pumping down the existing pit lake during the operational period to facilitate mining and allowing a larger pit lake to eventually form once mining operations cease. The No Action Alternative would also avoid potential impacts to seeps and springs located in the immediate vicinity of the open pit and at the eastern terminus of Percha Creek.

3.5.3 Mitigation Measures

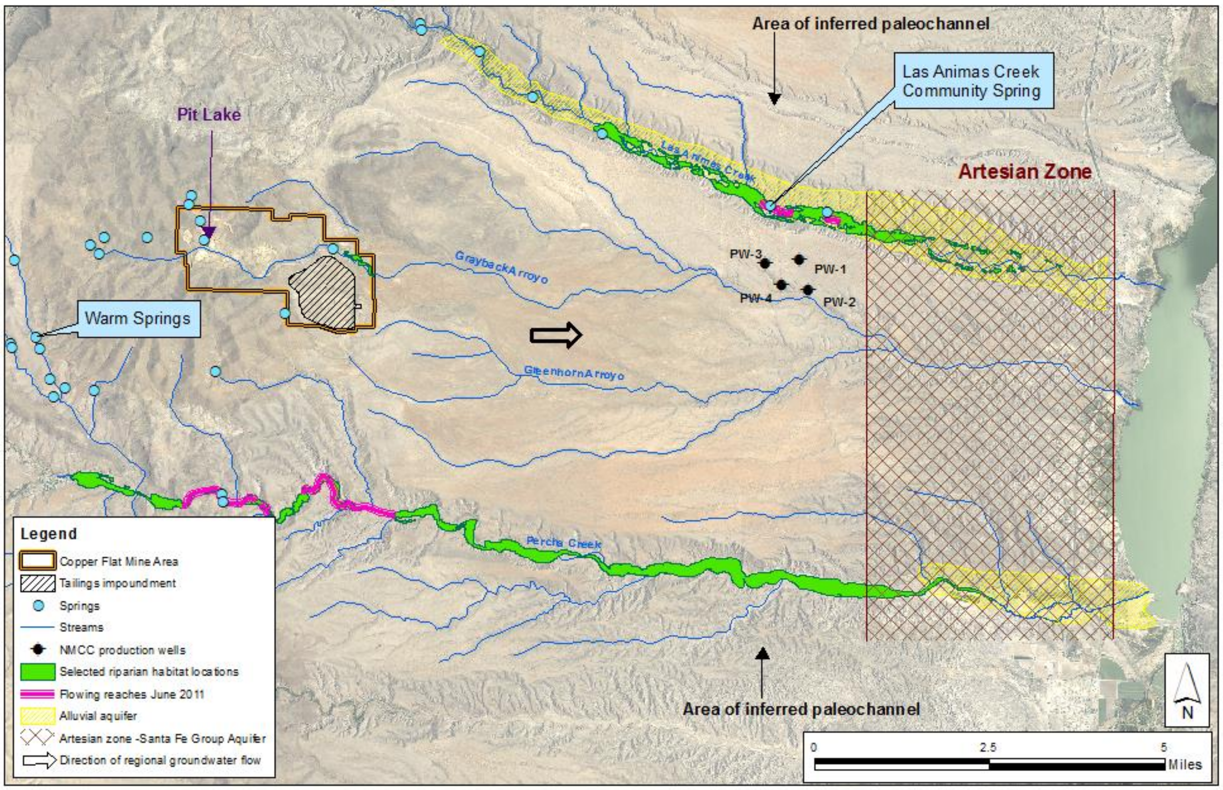
No mitigation measures for potential surface water depletions are proposed.

3.6 GROUNDWATER RESOURCES

3.6.1 Affected Environment

Groundwater resources within the affected environment include those near the Copper Flat mine area and those near the water supply wells. (See Figure 3-9.) Related geologic information is discussed in Section 3.7. (See Figures 3-23 and 3-24.) References used in compiling information on area groundwater include Davie and Spiegel (1967); Wilson et al. (1981); BLM (1999); JSAI (2011); Intera (2012); Jones et al. (2012); and Jones et al. (2013).

Figure 3-9. Hydrologic Features in Project Area



Source: Intera 2012; Jones et al. 2013.

3.6.1.1 Regional Hydrogeology

The principal water-bearing materials of the project area include the coarser sediments in the Santa Fe Group of the Palomas Basin and Warm Springs Valley, and saturated alluvium in the principal drainages. As documented in Jones et al. (2012), groundwater recharge occurs primarily in the uplands, where periodic rainfall and snowmelt are greater than elsewhere, and along the arroyos and losing stream reaches where ephemeral and intermittent surface flows can seep downward. Regional-scale groundwater flow is west to east, from about 5,800 feet amsl at the western edge of the Warm Springs graben to less than 4,200 feet amsl at Caballo Reservoir.

Except near the mine, data on water levels are sparse, making it difficult to accurately map the water table. The water level information that is available (e.g., Wilson et al. 1981, Plate 5) indicates that contours are closely spaced in the Animas Uplift and westernmost Palomas Basin, which indicates a relatively steep water level gradient and is evidence of lower transmissivity of the aquifer in those locations.

Contour spacing is much wider in the area of the NMCC well field, which indicates the water table gradient is flatter and the aquifer has a higher transmissivity and better potential to supply wells. The gradient steepens again east of the well field, indicating more restricted water movement toward Caballo Reservoir, as a result of substantial clays in the Santa Fe Group east of the well field.

Groundwater discharge is primarily to the Rio Grande valley, including river alluvium and Caballo Reservoir. Some discharge occurs locally to springs, to tributary streamflow, and to riparian vegetation along tributaries (primarily Las Animas and Percha Creeks). Discharge also occurs to area wells, most of which withdraw small amounts of water in comparison to the large production expected from the NMCC wells.

3.6.1.2 Hydrogeology of the Mine Pit Area

John Shomaker and Associates, Inc. (JSAI 2011) estimates hydraulic conductivity of the saturated crystalized bedrock in the mine area to be in the range of 0.05 to 0.1 feet per day, with the higher values in the fractured monzonite. These values are consistent with the findings of DBSA (1998). This equates to a transmissivity of no more than 10 square feet per day for each 100 feet of thickness, which is low. Because the rocks in the uplift are poorly transmissive, most groundwater from the highly transmissive Santa Fe Group sediments in the Warm Springs Valley flows around the uplift northeast toward Las Animas Creek or southeast toward Percha Creek. Disturbed areas at the mine area, such as areas of waste rock, are likely more permeable than the natural material. These areas may be locations of minor recharge to the local groundwater system.

The existing pit was excavated to below the local water table, and thus required dewatering for mining to occur. The pit lake elevation is currently as much as 100 feet below the regional groundwater table. Reflecting the low transmissivity of the bedrock, inflows to the lake are small despite the high gradient. Thus pumping rates for dewatering were no more than 50 gpm for the Quintana pit (Jones et al. 2013). In the absence of pumping for dewatering, the level of water in the pit lake reflects an approximate balance in which evaporation is the only depletion. Evaporation is offset by the inflows from precipitation, local runoff, and groundwater. Net outflow to groundwater does not occur at the pit.

3.6.1.3 Hydrogeology of the TSF

A portion of the existing TSF overlies Santa Fe Group materials. Local hydrologic conditions in this area have been extensively studied as part of a program to abate elevated levels of dissolved solids in groundwater caused by seepage from the existing tailings. Information below is taken from Intera (2011), which was submitted by NMCC to the NMED.

Seepage from the western part of the TSF flows directly into gravels of the Santa Fe Group. In the eastern part of the TSF, the Santa Fe is overlain by a shallow clay layer which in turn is beneath surficial stream terrace gravels. These gravels include old placer workings. Seepage from the eastern part of the TSF flows eastward through the gravels that overlie the clay, creating a water level mound that is higher than the regional water table. Tests on both the shallow and deeper gravels indicate a hydraulic conductivity of 1 to 5 feet per day.

A fault lies east of the TSF. The fault may act as a barrier to groundwater flow from the mound that occurs beneath the tailings. It may limit the extent of a sulfate plume that extends east of the TSF in the shallow gravels. For additional information on the existing plume, see Section 3.4.2.

3.6.1.4 Hydrogeology of the Palomas Basin in the Vicinity of the Supply Well Field

The existing water supply wells are located within the Palomas Basin on a mesa between Animas Creek (north) and Greyback Arroyo (south), about 8 miles due east of the mine and within 6 miles of Caballo Reservoir to the east. Dunn (1984) documents that the production wells were located following an exploration program that determined this to be the nearest location to the mine with sediments that have both sufficient thickness and permeability to support large capacity supply wells. The location coincides with a graben and paleo-channel. (See Figure 3-9.)

Figure 3-10 is a cross-section along Lower Las Animas Creek in the area of the supply wells. In addition to showing the graben in which the supply wells are located, the figure shows a shallow clay layer that serves as a perching horizon that would isolate flows in Las Animas Creek from effects of pumping of the mine supply wells. The presence of a clay layer is demonstrated in well logs and in aquifer test results. The cross-section also shows a substantial amount of clay east of the well field that is responsible for the artesian conditions found in many wells between the supply well field and the Rio Grande.

Groundwater flow in the area depicted by the cross-section is consistent with the overall flow in the Palomas Basin, which is west to east toward the Rio Grande valley. In the well field area the slope of the water table is less than 20 feet per mile, compared to 150 feet per mile near the mine (Wilson et. al., 1981). As previously noted, this difference in gradient is due to the differences in transmissivity in different parts of the aquifer.

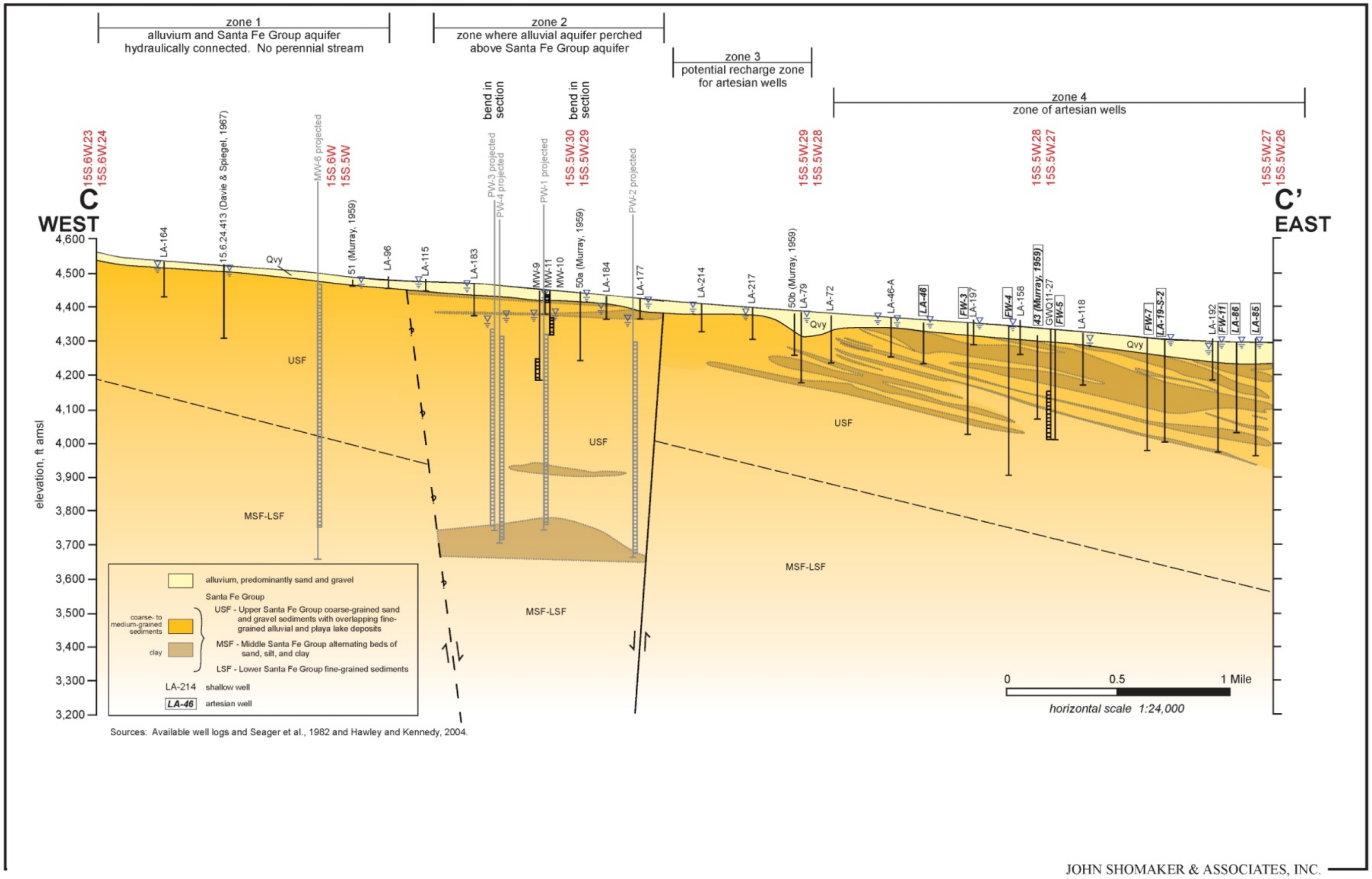
The 4 large-diameter (16-inch) production wells were originally tested to have individual well yields on the order of 1,000-2,000 gpm (Dunn 1984). Wilson et al. (1981) indicates that the wells penetrate a thickness of 950 to 1,000 feet of sand and gravel before encountering any thick clay beds. According to data in Intera (2012), the wells are typically screened over the bottom 600 feet. Depths to water exceed 300 feet, and the average water level in the wells is at 4,380 feet amsl.

Aquifer tests of the supply wells conducted by NMCC in 2012 resulted in a generalized estimate of the transmissivity of the upper 1,000 feet of the Santa Fe Group to be 20,000 square feet per day (i.e., hydraulic conductivity was estimated at 20 feet per day; see JSAI 2014). This is higher than the 11,000 square feet per day reported in BLM (1999), but that reference did not specify aquifer thickness and thus cannot be directly compared to the recent test result. DBSA (1998) also indicated a possible value of 11,000 square feet per day.

3.6.1.5 Hydrogeology of Alluvial Valleys in the Vicinity of the Mine and Well Field

The alluvial valleys potentially affected by the Copper Flat mine and well field are those streams and arroyos that drain the area near the mine and supply wells: Las Animas Creek, Percha Creek, Greyback and Greenhorn Arroyos, and the Rio Grande including Caballo Reservoir.

Figure 3-10. Cross-Section Near Supply Well Field



Source: JSAI 2012.

Las Animas Creek: The only published report specific to the hydrology of Las Animas Creek is Davie and Spiegel (1967). This reference provides information on area groundwater, for both pre-development and the historic conditions resulting from the development of surface irrigation systems and drilling of artesian wells, and was an important source of information used to construct the groundwater model. In the area near the project well field, the valley of Las Animas Creek is locally underlain by alluvial materials in the range of 20-60 feet thick. The materials contain shallow groundwater that is generally close enough to the land surface to be within the riparian root zone. Intera (2012) provides the results of a seepage study along Las Animas Creek. In most areas the creek is a losing stream (when there is runoff) and a source of recharge to the water moving in the underlying alluvium. Reaches with perennial flow occur near the water supply well field; the stream dries up below these reaches. (See Figures 3-9 and 3-10.)

Wilson et al. (1981) observed that the static water levels in the area of what is now the project well field were 25 to 50 feet lower than the water table in the Las Animas alluvium. That relationship is also shown in Intera 2012, is consistent with BLM (1999), and is illustrated by several triangular symbols on Figure 3-10 that indicate a shallow water table in the area labeled 'zone 2'. The data indicate that perched alluvial groundwater occurs in Las Animas Creek in the reach near the supply wells. This perched water has quite limited hydraulic connection to the main aquifer that will be directly impacted by the supply wells. Hydrology within the perched layer reflects localized conditions such as seepage from irrigation canals and irrigated fields, and pumping of domestic and other small capacity wells. The amount of downward seepage from the perched groundwater to the Santa Fe Group sediments is considered small (BLM 1999) and independent of water levels in the Santa Fe.

The clays in the Santa Fe Group east of the well field created artesian conditions, in which water levels were above the land surface before the aquifer was developed (Intera 2012). In that area there are large capacity irrigation wells that penetrate several hundred feet or more into the permeable materials of the Santa Fe Group. Artesian flows of tens to a few hundred gpm have been reported in these wells at various points in time. Pressures have declined over time, and some wells no longer flow (Jones et al. 2013). However, such wells can still produce several hundred gpm if pumped. According to Jones et al. (2012), the decline in artesian pressure may be due in part to poor well construction that resulted in leakage upward from the artesian zone by means of flow in and around the well casings.

Percha Creek: Near the supply wells, the valley of Percha Creek is underlain by alluvial materials up to 50 feet thick that contain groundwater (Wilson et al. 1981). The primary area where groundwater supports riparian vegetation or surface flow is in and just downstream of the Percha Box, where Paleozoic bedrock is at the surface and forces groundwater to flow to the surface. Elsewhere the stream is typically dry and such flow that does occur (e.g., from storm runoff) provides recharge to groundwater.

Many wells are found near Percha Creek in the vicinity of Hillsboro, New Mexico. These wells typically draw from shallow alluvium or from silts and clays in the Santa Fe Group (Seager et al. 1984) and yields are generally low. Data are not available on the water table elevation in the Percha Creek alluvium in the area of the supply wells, and the extent of perched conditions (if any) is not defined. Some artesian wells do occur near the downstream end of the creek, where the hydrogeology is similar to that in lower Las Animas Creek.

Arroyos: Alluvium is found along Greyback and Greenhorn Arroyos and consists primarily of sand and gravel; thickness varies between 5 and 50 feet (Intera 2012). Alluvium in Greyback Arroyo may be locally and seasonally saturated in the vicinity of the mine. Hydrologic conditions in arroyos near the supply wells have not been defined. No wells are known to obtain their supply from arroyo alluvium.

Rio Grande: Wilson et al. (1981) provide information on hydrogeology along the Rincon Valley. Alluvium deposited by the Rio Grande underlies the valley, including Caballo Reservoir. The material is up to 100 feet thick and overlies clays in the Santa Fe Group. Water levels are generally within 15 feet of the land surface, with a flow direction south at the same slope as the land surface (about 5 feet per mile). Specific capacities of wells in the Rincon Valley average 50 gpm per foot, a value which indicates a high hydraulic conductivity. Flow from the Palomas Basin to the discharge zone along the Rio Grande Valley is presumably affected by the elevation of water in Caballo Reservoir, but details on this relationship are not established.

Springs: Numerous springs are known to occur in the vicinity of the proposed mine and supply well field. (See Figure 3-9.) In this area, spring flows can originate in several ways.

- Most springs occur along the main creeks upstream of the well field where groundwater discharges from perched horizons, or from the emergence of shallow groundwater that overlies low permeability materials (e.g., Percha Box).
- Several small seeps and springs are located in the area of the mine pit (Intera 2012). These are higher in elevation than the regional water table and are interpreted as discharge from local perched water.
- Springs in Warm Springs Valley (including Warm Springs itself) are understood as an emergence of water due to the barrier effect of the Animas Uplift. Consequently, the generally eastward flow of groundwater in the valley is diverted around the low permeability rocks in the uplift, south to toward Percha Creek and north toward Las Animas Creek. Upflow of deep geothermal water along faults is an additional source of spring flow (Kelley et al. 2013).

Many of the springs have been observed to be dry at times; flow is thus often intermittent or ephemeral. However, limited data on “NWS” spring on Las Animas Creek indicate a measured flow of 0.7 to 1.1 cfs (Intera 2012). None of the published reports identify any springs that discharge from groundwater that is in direct hydrologic communication with the NMCC supply wells, pit lake, or TSF. Water from NWS spring is warmer than in other local springs and is believed to have a deep source.

3.6.1.6 Existing Uses of Groundwater

The New Mexico OSE maintains records on wells and water use. There is no compilation of data specific to the Palomas Basin. The New Mexico Water Rights Reporting System (NMWRRS) is the designation of OSE’s database which contains scanned copies of various documents in the State’s water rights files. Kevin Myers, staff hydrologist at OSE, provided the results of a search of the NMWRRS database for the area. The search identified nearly 700 separate points of diversion or well locations, mostly located along the valleys and in the area where artesian wells are found. Mr. Myers indicated the OSE files identify a large number of claimed or permitted water rights that total in excess of 6,000 AFY, most of which are for irrigation use, and in addition, many domestic and stock wells are listed.

The NMWRRS database includes information as reported by drillers and well owners, which commonly does not reflect any process of independent quality control to ensure the files are complete or the content not originating with the agency is accurate. In this instance, documents relating to the Quintana Mine water rights were not found in the database and location coordinates for some irrigation wells do not appear to correspond to areas where irrigated land is observed on air photos. Moreover, there are no data that indicate the amount of groundwater pumping that actually occurs within the area.

For some files, the database can provide unverified information on actual water use. The Hillsboro Mutual Domestic Water Consumers Association has the largest water right not associated with mining or irrigation. This right totals 217.75 AFY. Actual use was about 30 AFY in 2001, the most recent year when data from all three community wells were found in the OSE files.

3.6.2 Environmental Effects

Identification of Potentially Significant Impacts: Because the project requires pumping of large quantities of groundwater, impacts to groundwater are expected to be significant at times in certain locations. The following are the potential causes of such impacts:

- Pit dewatering during mining to provide pit access, and refill from post-mining natural inflow to the pit;
- Mine operations involving water management, such as infiltration from the waste rock and TSFs; and
- Pumping of the supply wells.

Specific impacts to groundwater resources of potential significance were identified through professional judgment of the EIS team, review of comments submitted during project scoping, and reports prepared by NMCC. The potential impacts that require evaluation are changes in the regional water budget from the causes noted above, as reflected in the following:

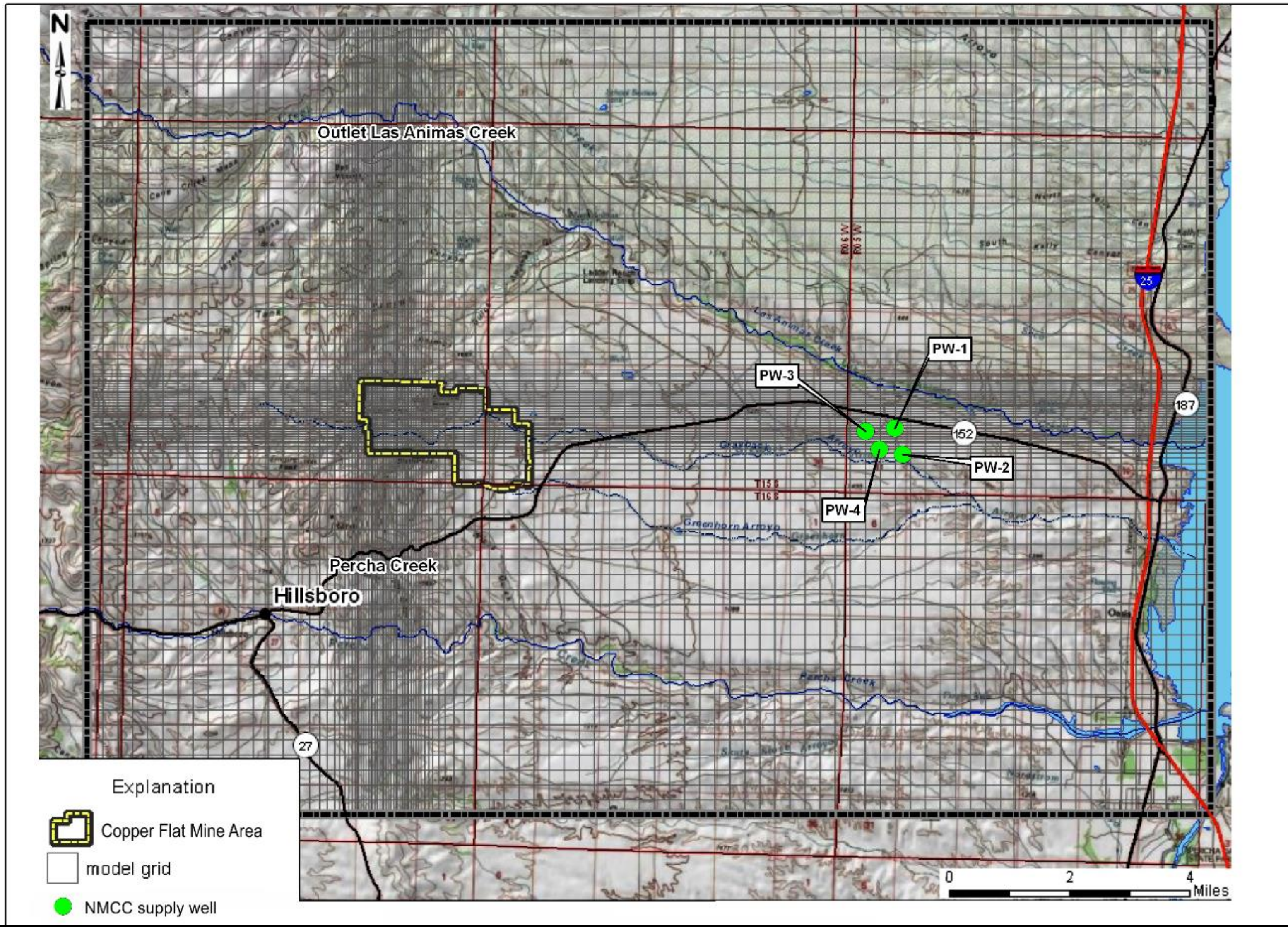
- Removal of water from storage and the resulting drawdown at wells, including community supply wells (e.g., Hillsboro), stock and domestic wells (e.g., Ladder Ranch), artesian irrigation wells (e.g., along lower Las Animas and Percha Creeks);
- Reductions in groundwater discharge to surface water supplies, including tributary streams, the Rio Grande, and Caballo Reservoir; and
- Other potential water table effects, such as reductions in discharge of individual springs and lowering of water levels in riparian corridors, especially in locations that provide important wildlife habitat.

Method for Quantification of Impacts: For a regional scale evaluation of groundwater impacts from a large project, an appropriate tool is a calibrated groundwater flow model. JSAI (2014) describes the model developed for NMCC. JSAI reports that its model was calibrated to match regional groundwater contours and specific well hydrographs. The JSAI report provides substantial detail beyond the summary provided in this EIS.

Description of the Groundwater Model: JSAI used a modified version of the USGS MODFLOW code. The JSAI model has 4 layers, with a grid of 87 rows and 109 columns. (See Figure 3-11.) Layer 1 represents the shallow alluvium along lower tributaries and in the Rio Grande valley. Layers 2 through 4 primarily represent bedrock in the uplifts, and the Santa Fe Group aquifer elsewhere.

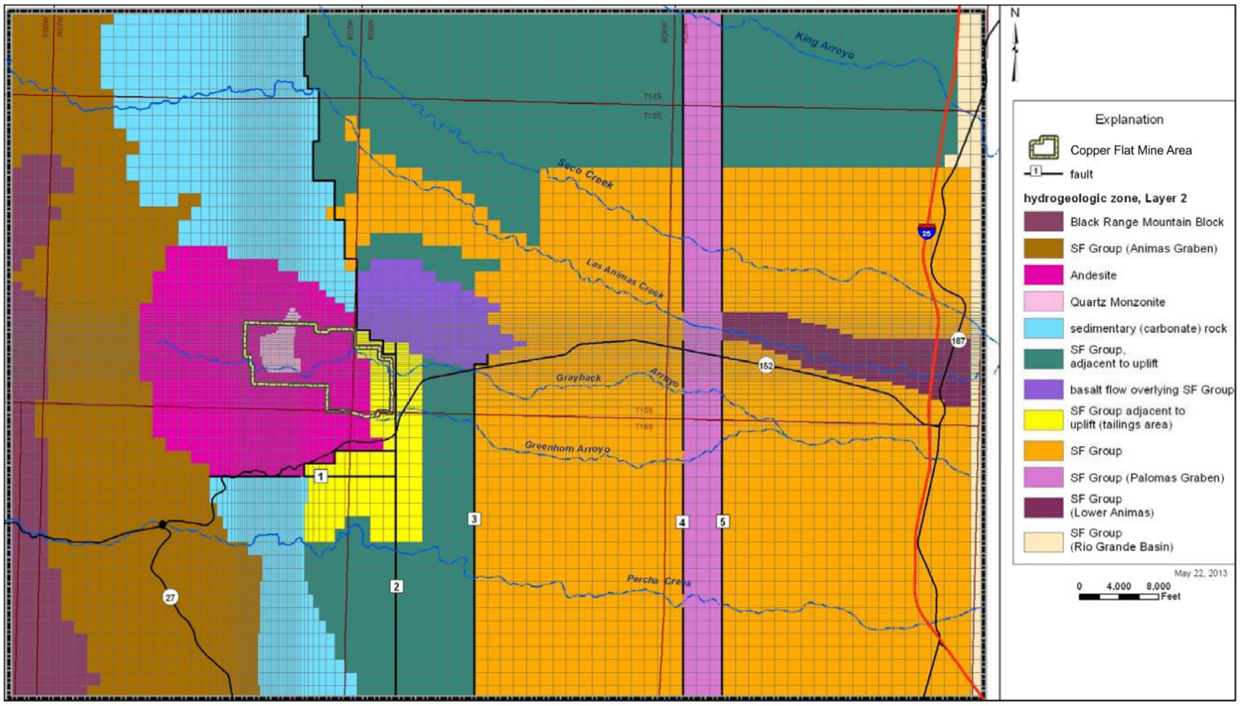
Mine-related pumping occurs largely in layer 2 of the model, which is the shallowest aquifer in all areas of the model except along the major streams near the Rio Grande. Layer 2 is 1,000 feet thick in most areas of the model and is the part of the model where pumping impacts will be concentrated. (See Figure 3-12.)

Figure 3-11. Domain and Grid of Groundwater Flow Model Developed for NMCC



Source: Modified from Figure 6.1 in JSAI 2014.

Figure 3-12. Layer 2 Hydrogeologic Zones, JSAI Model



Source: From Figure 6-3 in JSAI 2014.

For purposes of impact prediction, among the most critical inputs to the model are the aquifer hydraulic properties, especially for the areas of the mine and well field where impacts will be greatest. Table 3-18 reproduces the values used in the JSAI model. Most entries in the table represent typical values for the types of materials indicated.

Table 3-18. Modeled Aquifer Parameters

Table 3-18. Modeled Aquifer Parameters						
Hydrogeologic Unit	**Transmissivity (ft^2/dy)**	**Saturated Thickness (ft)**	**Hydraulic Conductivity (ft/dy)**	**Vertical Anisotropy (ratio)**	**Specific Yield (5)**	**Storage Coefficient (%)**
Layer 1						
Alluvium / SF Group	2,400	50	48	1.25E-04	10%	
Alluvium / SF Group (Lower Animas and Rio Grande Basin)	10,000	200	50.0	160E-04	10%	
Layer 2						
Black Range Mountain Block	2	1,000	0.002	0.01	0.1%	0.1%
SF Group (Animas Graben)	500	500	1.000	0.01	10%	10%
Andesite	2	1,000	0.002	0.01	0.1%	0.1%
Quartz Monzonite	2	1,000	0.002	0.01	0.1%	0.1%
Sedimentary (carbonate) rock	80	1,000	0.080	0.01	0.5%	0.5%

Table 3-18. Modeled Aquifer Parameters (Concluded)						
Hydrogeologic Unit	Transmissivity (ft^2/dy)	Saturated Thickness (ft)	Hydraulic Conductivity (ft/dy)	Vertical Anisotropy (ratio)	Specific Yield (5)	Storage Coefficient (%)
SF Group adjacent to uplift, edge of basin	200	1,000	0.200	1.0	5%	5%
SF Group adjacent up uplift (Upper Animas)	40	200	0.200	0.01	5%	5%
Basalt flow overlying SF Group	0.2	200	0.001	0.01	1%	1%
SF Group	900	1,000	0.900	0.01	10%	0.1%
SF Group (Palomas Graben)	10,000	1,000	10.000	1.0	10%	0.2%
SF Group (Animas Creek above graben)	2,000	200	10.000	0.0001	10%	0.1%
SF Group (Lower Animas)	20,000	1,000	20.000	0.01	10%	0.1%
SF Group (Rio Grande Basin)	20,000	1,000	20.000	1.0	10%	0.1%
Layer 3						
Black Range Mountain Block	2	2,000	0.001	0.01		0.01%
Bedrock (Graben)	700	1,000	0.700	0.01		0.01%
Andesite	2	2,000	0.001	0.01		0.01%
Quartz Monzonite	2	2,000	0.001	0.01		0.01%
Sedimentary (carbonate) rock	100	2,000	0.050	0.01		0.01%
SF Group, adjacent to uplift	400	2,000	0.200	0.01		0.4%
SF Group (Palomas Graben)	8,000	2,000	4.000	1.0		0.4%
SF Group, lower Animas	10,000	1,000	10.000	0.01		0.1%
SF Group (Rio Grande Basin)	800	2,000	0.400	0.01		0.4%
Layer 4						
Black Range Mountain Block	3	3,000	0.001	0.01		0.01%
Bedrock (Graben)	100	2,000	0.050	0.01		0.01%
Andesite	3	3,000	0.001	0.01		0.01%
Quartz Monzonite	3	3,000	0.001	0.01		0.01%
Sedimentary (carbonate) rock	150	3,000	0.050	0.01		0.01%
SF Group (Palomas Graben)	2,000	3,000	0.667	0.01		1%
SF Group (Rio Grande Basin)	2,000	3,000	0.667	0.01		0.6%

Source: From Table 6.1 in JSAI 2014.

JSAI's professional judgment, constrained by such data as may be available, is the basis for other aspects of model construction. As described in the cited JSAI report, these include estimates of the historic and existing water budget, the location and effects of faults, and the nature of the external boundaries.

Evaluation of Groundwater Model: The BLM's groundwater consultant, Lee Wilson and Associates (LWA), reviewed the JSAI groundwater model. The review included meetings with JSAI, in which hydrologists from the BLM and the New Mexico OSE also participated. The objective of the review was to determine whether the model is appropriate for use in the BLM's impact predictions. One purpose of the review process was to confirm that the predictions made by the JSAI model were comparable in location and magnitude to those used in a previous EIS conducted for the Copper Flat mine (BLM 1999). The JSAI model predicts impacts that are generally equal to or greater than reported in that earlier EIS.

JSAI's model uses a modification of the USGS MODFLOW code. Model results reported in this EIS were verified by LWA using a conversion of the JSAI model into MODFLOW 2005. JSAI relied on aquifer tests at the well field to obtain a reliable estimate of transmissivity in the area where the project will have its greatest impact. Other inputs to the model reflect JSAI's professional judgment, supported by the aquifer test results and/or the published literature.

Specific confirmation of model construction for the entire study area is not possible due to the sparsity of existing data. For example, data do not exist to confidently map the regional water table except at a gross scale, hence calibration of the model to match regional water gradients was necessarily approximate. The model is calibrated to the general direction of groundwater flow and the overall regional water table gradient. Model inputs are consistent with what is known about the geology and hydrology of the rock units found in the area, especially near the wellfield.

Because many model parameters are constrained by limited data, JSAI was asked to do three sensitivity runs of its model with alternative assumptions about hydrogeology. JSAI memos summarizing the results of these model runs are provided in Appendix F.

1) One sensitivity scenario assumed that the fault between the proposed mine pit and the Percha Box would not impede groundwater flow. This was done to test if the model construction might be underestimating impacts to Hillsboro and the Percha Box. The results confirmed that construction of the model is appropriate and did not indicate potential impacts significantly greater than reported in this EIS.
2) Another scenario assumed that the ratio of vertical to horizontal hydraulic conductivity in the Santa Fe Group is not 1:1 as in the JSAI model, but 1:100 as is more commonly found in New Mexico and could be a value interpreted from the NMCC aquifer tests. This was done to test if model construction might strongly affect the prediction of where and how much water level decline would occur in area wells. The results identified no basis to modify parameters of the JSAI model.
3) A third scenario assumed specified flow conditions at the northern General Head Boundary (GHB) of the model, to test the possible magnitude of a shift of impacts from outside to inside the model area if the GHB supply did not increase during mining. The results represent a worst-case estimate of how much impact the project could have on the Rio Grande if the northern boundary provides less water than simulated in the adopted model. The results of this evaluation are consistent with the EIS finding that the pumping of the supply wells would have significant impacts on the Rio Grande.

Other issues were identified in review of the model and discussed with JSAI. These included use of a high elevation for Caballo Lake, high water levels simulated near the south boundary, and alternative interpretations of the north and south boundaries. In the judgment of LWA, none of these issues were determined to preclude use of the model for prediction of impacts with the confidence needed for an EIS evaluation. This is mostly because the impact predictions are based on a modeled comparison of conditions with and without a mine, rather than on a match between modeled and observed data. Thus model results reflect a change in conditions, and any issues in model construction do not affect the comparability of the before and after conditions, so the interpretation of impacts is not greatly impacted by such issues.

Based on its review, the BLM considers the JSAI model to be suitable for this NEPA analysis.

Application of Groundwater Model: The hydrologic principle of predicting mine impacts is that the volume of water pumped for pit dewatering and mine operations must be balanced by water removed from aquifer storage as reflected in a decline in the water table, by reduced discharge to streams or vegetation, or by increased flow across a model boundary. Thus, the primary application of the model is to quantify the character, location, magnitude, and timing of effects to storage or flow, for both the time while pumping occurs and after mining ceases.

For EIS purposes, the primary model results are: a) maps and graphs showing drawdown (water level effects) caused by pumping; b) graphs showing streamflow and other depletions over time caused by pumping; and c) tables that quantify the impacts to the regional water budget caused by pumping. This array of results is directly responsive to issues raised by the public in the scoping process.

Model runs were conducted for the Proposed Action and two alternatives. Specific input quantities used in the model runs are shown below. (See Table 3-19.) Because the alternatives have different ore production rates, the rates of groundwater pumping differ by a factor of about 1.5 when comparing Alternative 2 (highest rate of mining) to the Proposed Action (lowest rate of mining). Alternative 1 is intermediate. The difference in total volume of water pumped is less marked than the difference in pumping rates, with the quantity for Alternative 2 being about 20 percent higher than Alternative 1, with the Proposed Action in between.

Table 3-19. Factors Used in Groundwater Modeling of Mining Scenarios

Table 3-19. Factors Used in Groundwater Modeling of Mining Scenarios

	Proposed Action	Alternative 1	Alternative 2
Mining rate (tpd)	17,500	25,000	30,000
Mining duration (years/months)	15 yrs 8 months	10 yrs 11 months	11 yrs 5 months
Average supply pumping (gpm)	2,357	3,280	3,785
Summer maximum supply pumping (gpm)	2,802	3,727	4,227
Winter minimum supply pumping (gpm)	1,971	2,896	3,396
Total supply pumping for mine duration (AF)	59,605	57,794	69,750
Average supply pumping (AFY)	3,805	5,294	6,109
Average pit dewatering rate (after initial 4.5 months) (gpm)	27	28	28
Cumulative volume removed from aquifer as of end of mining (AF)	60,278	58,260	70,239

Note: See also JSAI 2014.

JSAI used the model to simulate groundwater flow and the regional water budget for a variety of conditions. In this draft EIS, model results are presented by comparing a future without mining to effects of future mining and post-mining conditions for different mining scenarios. While flow from existing artesian wells is simulated in the model, return flows from such wells is not, nor does the model simulate any effects from pumping of conventional wells of other ownership. Thus, model results are effectively the change in conditions directly resulting from the NMCC mine, and not a simulation of the cumulative impact of all water uses.

Much of the modeled impact from the NMCC production well field is in the form of flow across the northern and southern model GHBs. In tables and graphs presented below, these components of the water balance are presented as follows: a) the flow across the south boundary is included in "groundwater discharge to the Rio Grande below Caballo Dam"; and b) the flow across the north boundary is labeled "Inflow to graben from north of model area". The model does not quantify how much of the north boundary inflow would be taken from storage, and how much by a reduction in discharge to the Rio Grande. For purposes of a worst-case assessment, the assumption in the EIS is that the entirety represents a river impact; this has the effect of treating the GHB flow the same at both the north and south ends of the graben. To the extent that both GHB flows are supplied from storage, the project would have a smaller maximum effect on the river, but the impacts would extend over a somewhat longer timeframe than assumed in the EIS.

Model results could potentially include thousands of maps, graphs, and tables, such as drawdown graphs for every single model cell. For this EIS, model outputs have been selected to provide a useful representation of impacts over space and time. Impacts are presented first for the Proposed Action, with a focus on the largest impacts. The subsequent discussion of impacts from Alternatives 1 and 2 is abbreviated, because the alternatives have almost the same effect as the Proposed Action. Appendix E provides additional detail in the form of drawdown graphs for locations receiving less impact than the locations discussed in the body of the EIS.

3.6.2.1 Proposed Action

3.6.2.1.1 Mine Development and Operation

Impacts to groundwater occur from development/operation through closure/restoration.

Water Budget: Table 3-20 quantifies aspects of the regional water budget resulting from the well field component of the Proposed Action, as extracted from the model output files. Subsequent discussions further illustrate and explain these impacts. Table 3-20a addresses annual effects.

- The first column in Table 3-20a quantifies the rate at which proposed mining is predicted to cause depletions of streams, reductions in flows of artesian wells, reductions in evapotranspiration (ET) rates, and flow drawn in across the northern model boundary. The values are for 3 months after mining ceases, which is approximately the time of maximum impact to streams and wells. The flow effects are thus the consequence of water refilling the aquifer after mining. The total flow impact of 2,718 AFY is approximately in balance with the rate at which refill occurs. Water budget impacts in lower Animas and Percha Creeks, below any diversions, are included in the Rio Grande impacts above and below Caballo Dam, respectively.
- The quantity of water identified in Table 3-20a as discharge from flowing wells is a reduction in flow that would otherwise potentially contribute to the Rio Grande, and thus would add to the Rio Grande impacts. The reduction in flow would reduce the supply of water to irrigated land in the artesian zone. In turn, this would result in reduction in irrigated acreage, or replacement of the lost irrigation supply by pumping of the artesian wells, or a combination of the two. The effects of possible irrigation replacement pumping are discussed separately.
- The second column in Table 3-20a quantifies the same effects as the first column, but calculated as of 100 years after mining ceases. The table indicates that after mining is over, the aquifer would recover and the effects from mining would eventually disappear.
- The third column in Table 3-20a provides flow quantities in the absence of the project; the values in columns 1 and 2 are the changes in that baseline.
- Table 3-20a does not include the flow resulting from pit deepening and dewatering. That impact is modeled at 21 AFY at the end of mining,

- Table 3-20b quantifies the model results for the cumulative volume of water that is removed from storage or depleted from streams and flowing wells during the life of the mine. The storage term includes 672 AF of drainage to the pit. Under the Proposed Action, NMCC is projected to withdraw 60,278 AF from groundwater. (See Table 3-19.) Table 3-20b indicates that the model results account for the volume change of 60,224 AF. This is 54 AF less than the amount simulated as pumped by wells or drained to the pit, a difference of less than 0.1 percent.

Table 3-20. Regional Water Budget for the Proposed Action

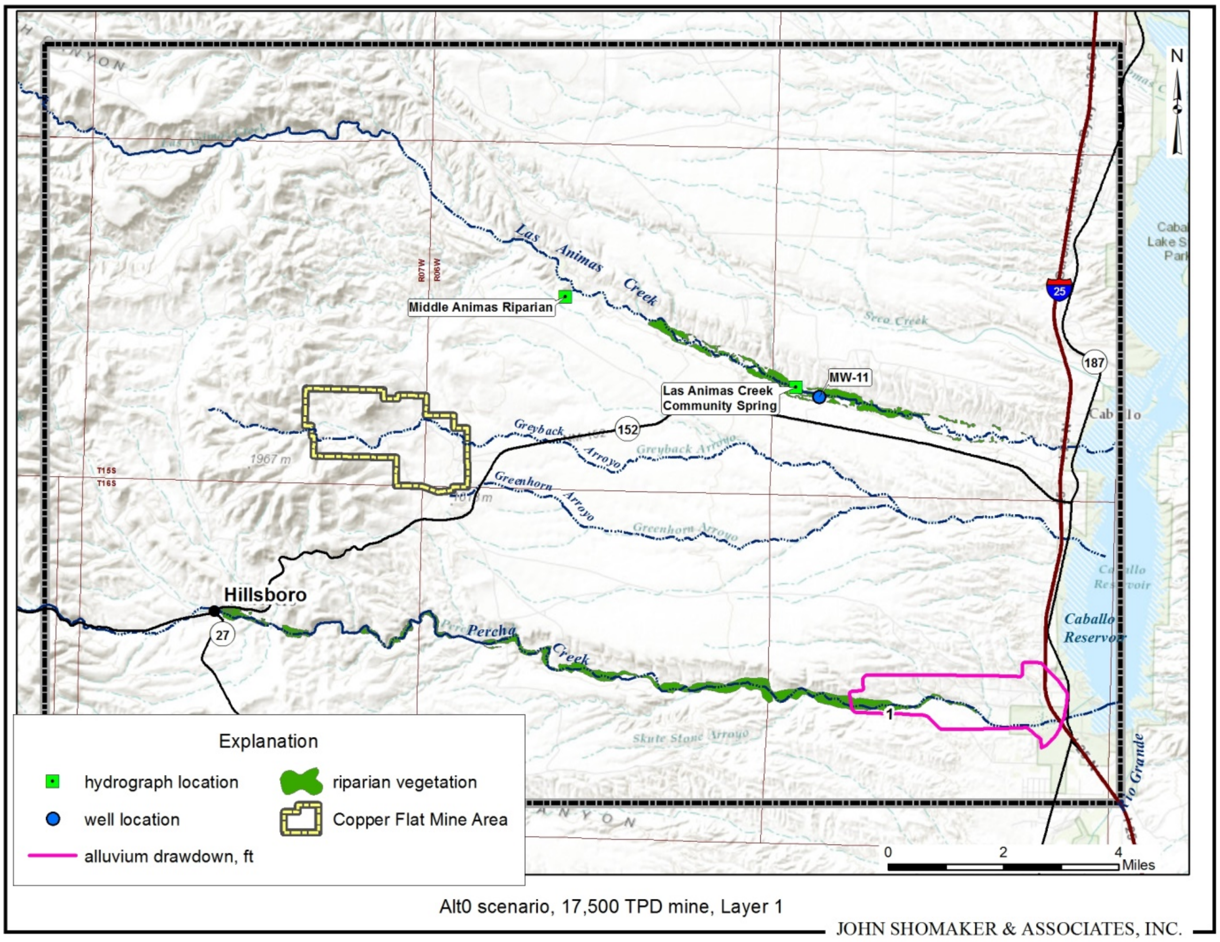
Table 3-20a. Change in Flow, Acre-Feet Per Year from Well Field Pumping			
Parameter	**Decrease from No Mine, 3 Months After End of Mining**	**Decrease from No Mine, 100 Yrs After Mining**	**Flow Rate with No Mine**
Groundwater discharge to Rio Grande above Caballo Dam	807	24	10,561
Groundwater discharge to Rio Grande below Caballo Dam	657	3	1,234
Discharge from flowing wells	765	4	2,030
Animas Creek ET and flow reduction	12	1	4,848
Percha Creek ET and flow reduction	18	3	2,630
Inflow from graben north of model area	459	3	2,184
Total change in flow terms	**2,718**	**38**	

Table 3-20b. Cumulated Change in Volume From Well Field and Pit Drainage, Acre-Feet	
Parameter	**Volume Change 3 Months Post-Mining (AF)**
Storage	29,837
Rio Grande above Caballo Dam	8,845
Rio Grande below Caballo Dam	7,106
Flowing wells	8,680
Animas Creek flow and ET	140
Percha Creek flow and ET	178
Inflow from graben north of study area	5,438
Total	**60,224**

Drawdown: Table 3-20b indicates that during active mining, a large quantity of water would be removed from aquifer storage. The removal of water from storage would cause a decline in water levels in the affected aquifer. Figure 3-13a provides a map showing the drawdown or decline in water levels in model layer 1 (shallow alluvial aquifer) expected to result from the Proposed Action. Figure 3-13b is the equivalent drawdown map for model layer 2 (upper portion of Santa Fe Group aquifer). Figure 3-13c is a map of drawdowns in layer 2 that would occur in addition to those shown in Figure 3-13b in the event that private wells in the lower valley of Las Animas Creek were pumped to offset the effects from pumping the NMCC supply wells. The Proposed Action would have no effect on the perched alluvium (layer 1) along Las Animas Creek.

The maps reflect conditions at the end of mining, when impacts are at or near their maximum. Impacts to layer 1 of the model would be small and only in locations where the alluvial groundwater is direct hydrologic communication with the Santa Fe Group (Figure 3-13a). Drawdown of up to 1.5 feet is simulated in the shallow aquifer along Percha Creek southeast of the well field, and in a small area in the Rio Grande alluvium east of the well field near Caballo Reservoir. The model predicts drawdowns in the shallow alluvium along Las Animas Creek to be less than 1 inch. In general, the clays found in the Santa Fe Group east of the well field limit the impacts to the shallow aquifers along the tributary streams, and instead lead to greater impacts to artesian wells and the Rio Grande than might otherwise occur. The perched alluvium along parts of Percha Creek would not be affected by the project.

Figure 3-13a. Map of Water Level Declines in Layer 1 at End of Mining - Proposed Action



Source: JSAI 2015.

Much larger impacts are predicted to occur in layer 2 (Figure 3-13b). The impacts in layer 2 are summarized below.

- As a general concept, the regional direction of groundwater flow (from the western uplands eastward toward the Rio Grande) would be modified near the pit (bedrock aquifer) and well field (Santa Fe Group aquifer). In those locations, flow would divert toward the center of the cone of depression formed by NMCC pumping, even to the point that in areas east of the pumping centers, the flow direction could be completely reversed.

- A deep (>700 feet) and steep-sided cone of depression is predicted to occur in the andesite bedrock aquifer at the mine as the pit is progressively excavated and continually dewatered. The depth of the cone would slightly exceed the depth of the pit, which must be pumped dry for safe mining. Based on the model results, effects would not reach the area of Hillsboro because the areal extent of the drawdown impact is limited by the low hydraulic conductivity of the bedrock. Compared to drawdown at the existing pit, the impact would be deeper, and larger in areal extent. The pit would be occupied by a lake simulated to have an area of 18.6 acres and an annual evaporation loss of about 100 AFY. The lake level would stabilize at an elevation at which groundwater inflow plus runoff and direct precipitation offsets lake evaporation. The evaporation loss would act in a manner equivalent to ongoing pumping, so that a deep but narrow drawdown cone at the pit would be permanent and continue to slowly expand over time, even after mining has ceased.
- A much smaller and shallower (<20 feet) cone of depression is shown along Greyback Arroyo about 2 miles east of the pit. This is the simulated result of groundwater flowing beneath the arroyo being intercepted by the pit, and is an impact that would grow over time. Field data do not exist to confirm such subflow, but to the extent the impact does occur, it would be localized. If the subflow does not actually exist then the water level decline at the pit could be slightly larger than is currently simulated.
- A regionally extensive cone of depression is predicted to occur in the Santa Fe Group aquifer around the supply wells. The maximum impact is within the area of the well field at the end of mining and is on the order of 45 feet. Drawdowns inside the pumping wells would be larger. The cone of depression would be elongated north-south due to the effect of faults to the west of the supply wells and clays in the aquifer to the east. For example, the contour that shows a water level decline of 10 feet at the end of mining extends more than 3.5 miles east toward the Rio Grande and about 5 miles to the north and south of the well field. The extent, if any, to which such drawdowns may impair existing wells would be determined by the New Mexico OSE.

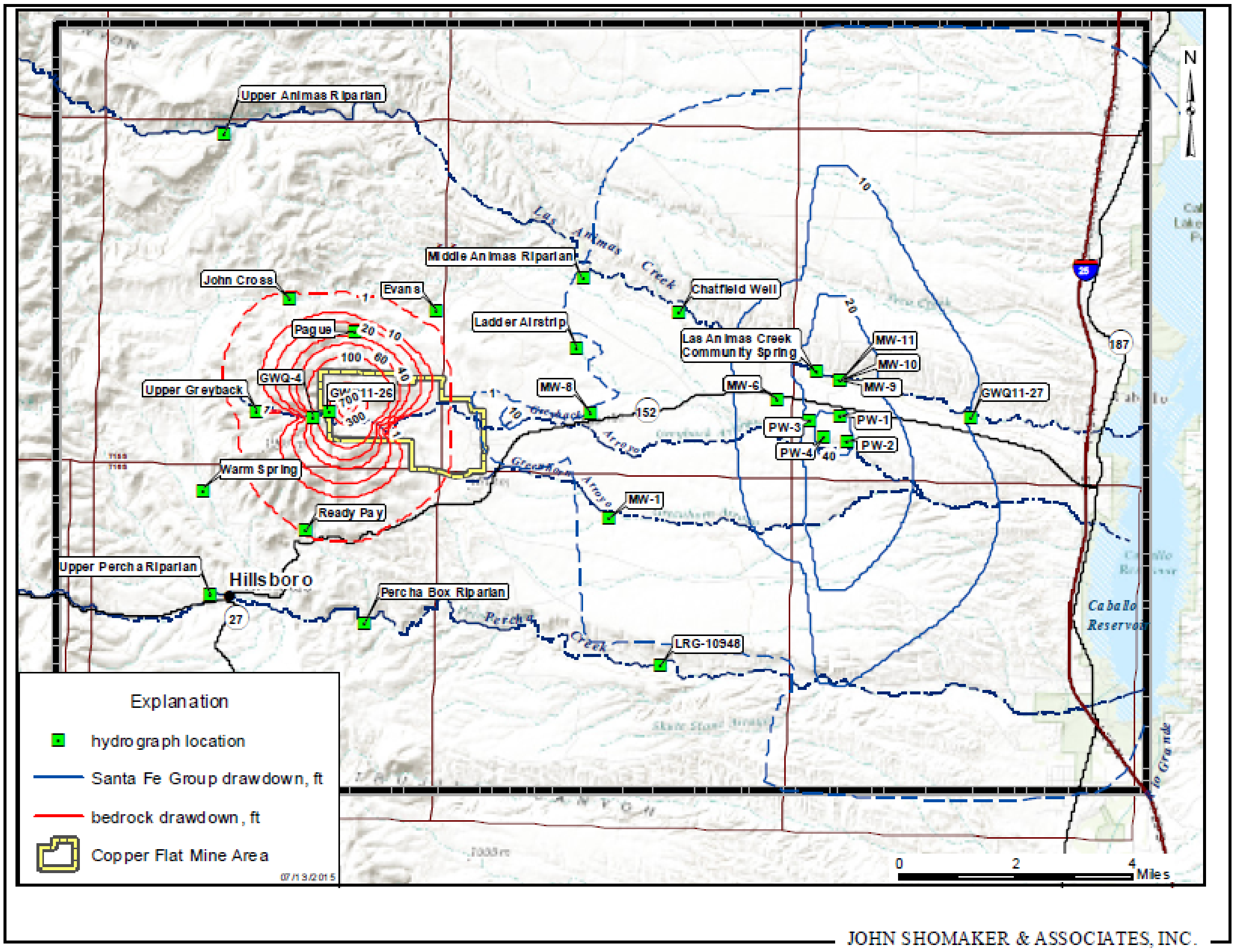
The nature of drawdown resulting from the project can also be illustrated using well hydrographs. Well hydrographs are plots of water levels at specific locations over time. The hydrographs provided in this EIS extend through the period of mining, and beyond to 100 years from the end of mining. Hydrographs thus indicate the trend in water levels that lead to the drawdown conditions shown on Figure 3-13a and 3-13b, and water level changes after that time. The possible additional drawdown shown in Figure 3-13c is not included in the hydrographs.

Figure 3-14 provides two hydrographs for well locations labeled on Figure 3-13b, one near the mine pit which shows the largest direct effect of the pit on the surrounding area; and one in the heart of the production well field, which shows the maximum impact from pumping for water supply.

- The hydrograph for GWQ11-26 is for a location near the edge of the mine pit. With excavation and dewatering of the nearby pit, water levels in the andesite bedrock unit at this location would fall nearly 300 feet. After cessation of pumping, continued evaporation from the permanent pit lake would have an ongoing effect on the surrounding area, such that water levels at this location would recover only slightly. (See Figure 3-14a.)
- The hydrograph for PW-1 is for a NMCC production well. The graph shows a progressive decline in water levels in the Santa Fe Group aquifer to a maximum of about 40 feet of drawdown in the adjoining aquifer at the end of mining. Water levels would begin to recover once pumping stops, and substantial recovery would be observed within 15 years. Effects from possible area pumping to replace the lost artesian flow are not included in this hydrograph. (See Figure 3-14b.)

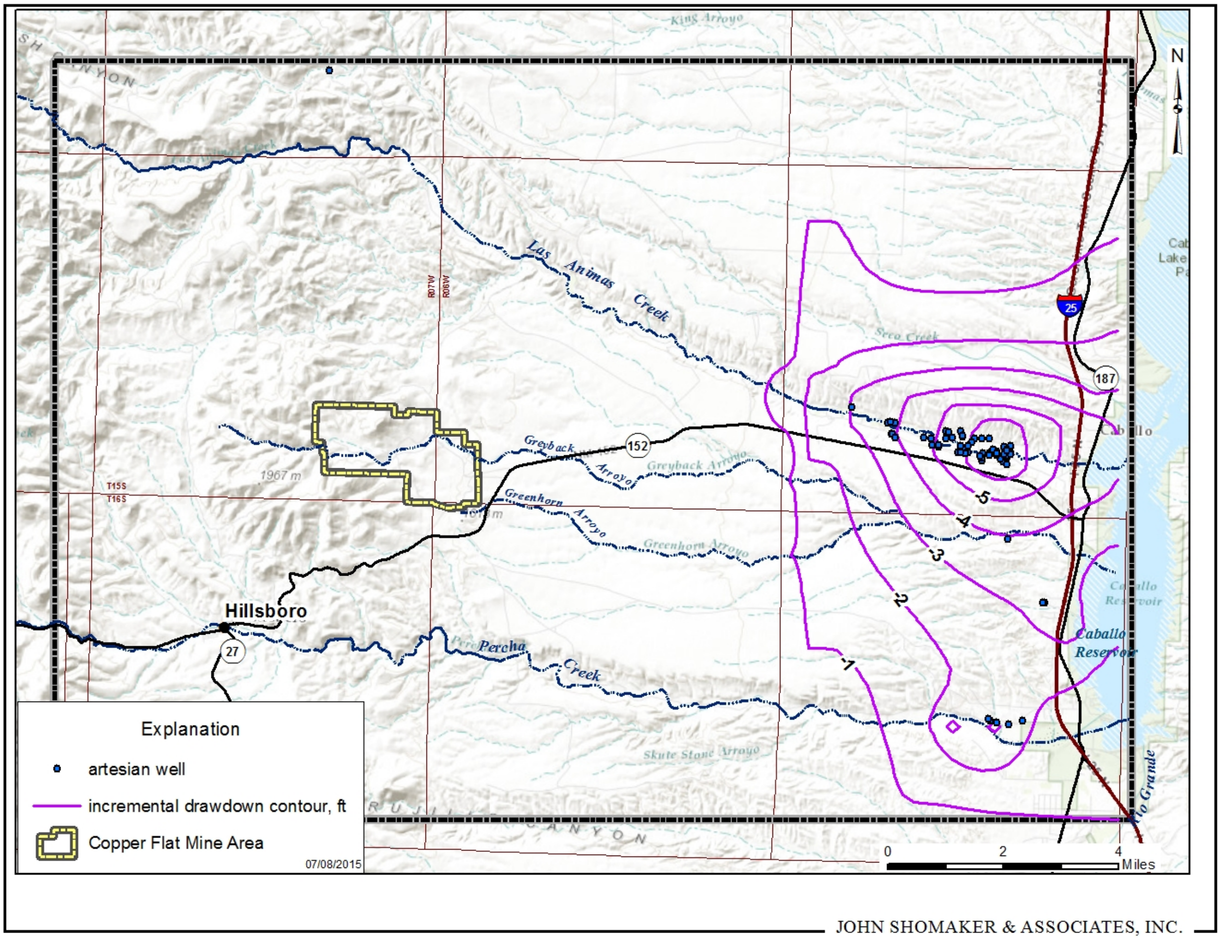
Additional hydrographs are provided in Appendix E. The locations of the hydrographs are shown by labeled symbols on Figures 3-13a and 3-13b. Hydrographs for locations near the pit are similar to Figure 3-14a; impacts would decrease rapidly away from the pit but would be permanent within the bedrock aquifer. Hydrographs for wells in the Santa Fe Group aquifer east of the mine are similar to Figure 3-14b; impacts decrease gradually away from the supply wells and show relatively rapid recovery. Hydrographs for wells in layer 1 show essentially no change.

Figure 3-13b. Map of Water Level Declines in Layer 2 at End of Mining - Proposed Action



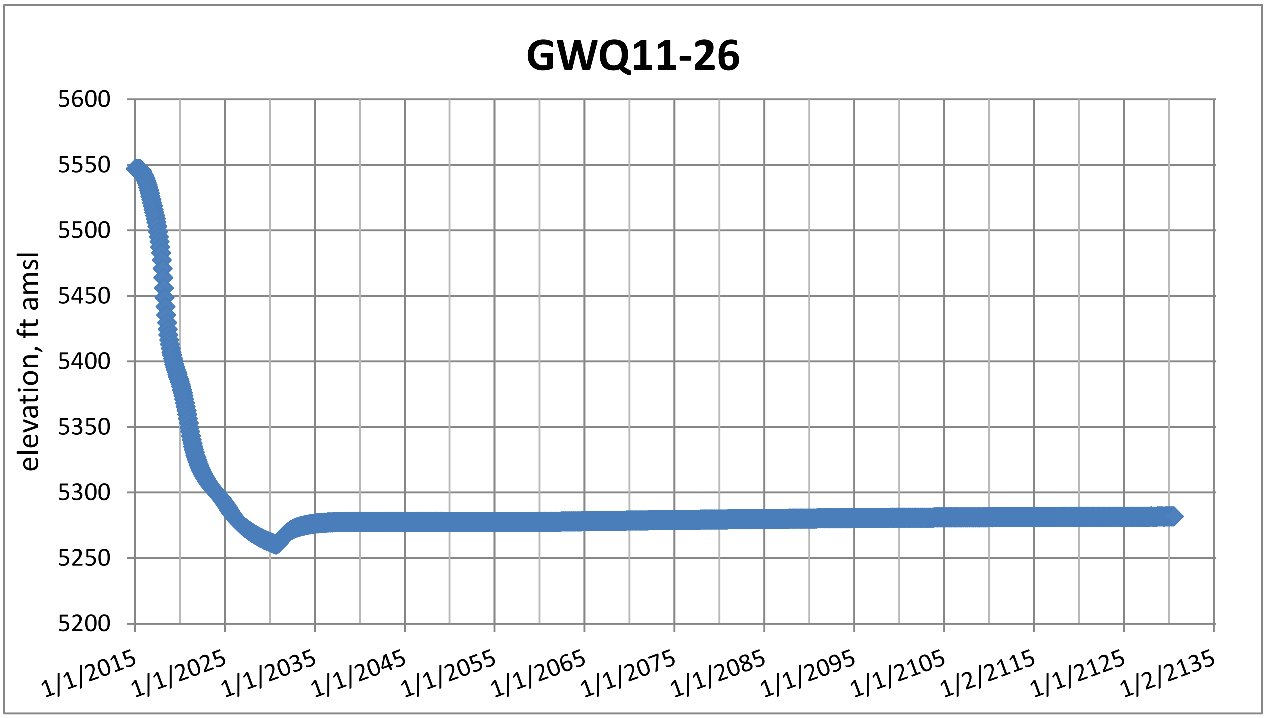
Source: JSAI 2015.

Figure 3-13c. Map of Water Level Declines in Layer 2 at End of Mining, Proposed Action, Resulting From Potential Increased Pumping of Artesian Wells



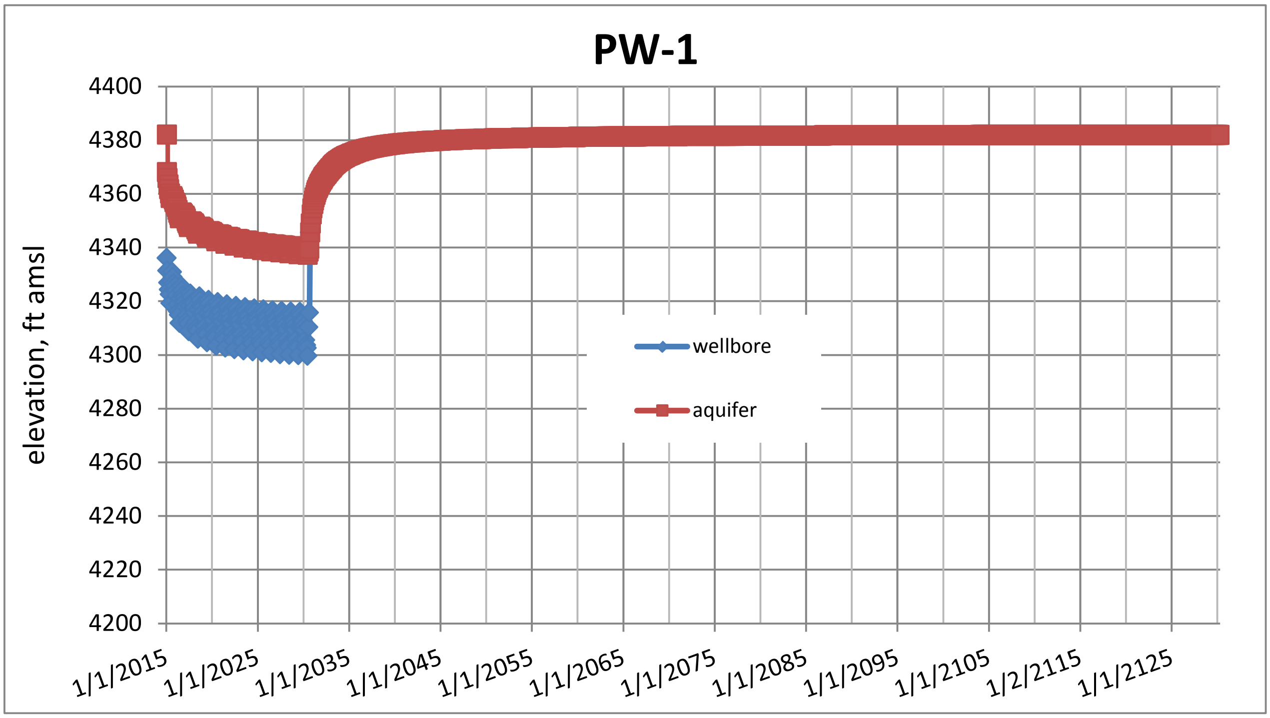
Source: JSAI 2015.

Figure 3-14a. Projected Water Level at GWQ11-26, Proposed Action



Source: JSAI 2014.

Figure 3-14b. Projected Water Level at PW-1, Proposed Action

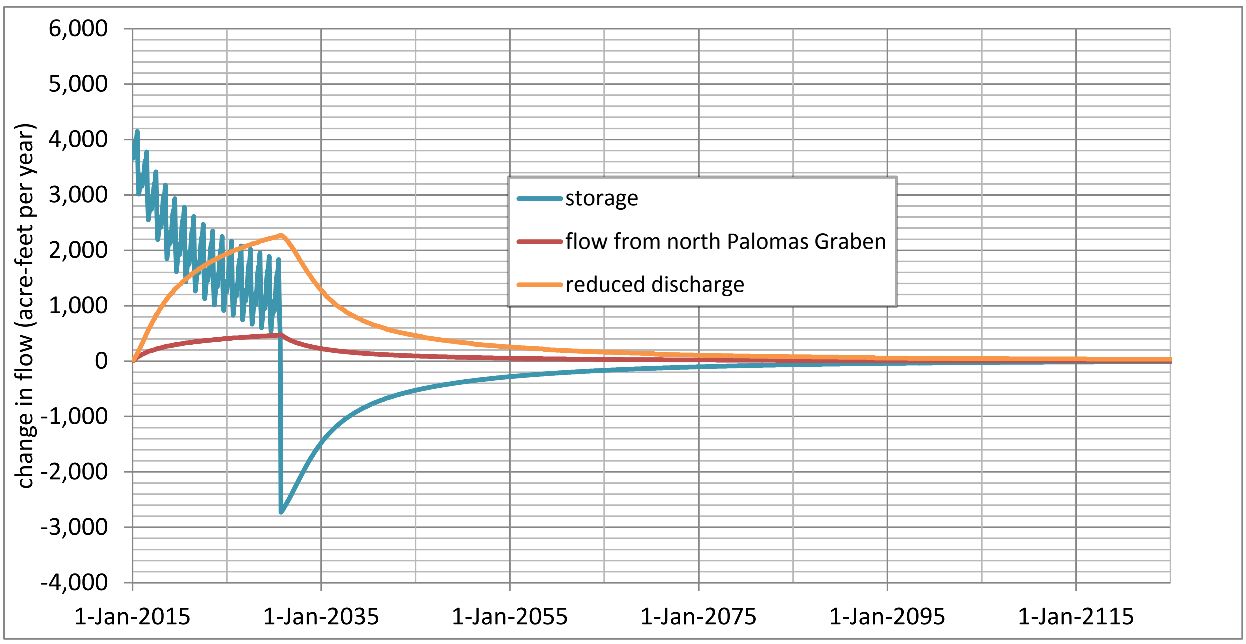


Source: JSAI 2014.

Impacts to individual private wells, other than artesian wells, are not simulated in the model. Drawdowns can impact pumping costs and well yield. Measurable impacts to well yield would be expected only to wells that: a) draw their water from the Santa Fe Group aquifer; b) are close enough to the production wells that impacts to water levels might be measured in tens of feet; and c) are so shallow such drawdown would impede production (i.e., penetrate only several tens of feet into the aquifer). At this time, the BLM has identified no such wells.

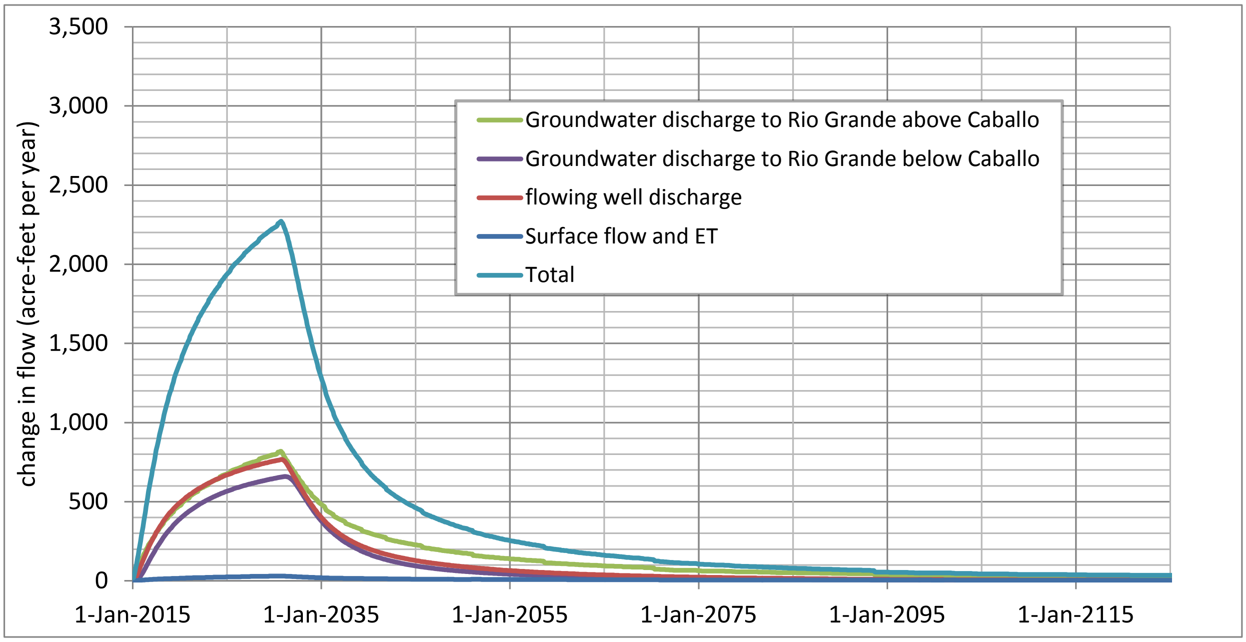
Impacts to Regional Water Budget: Figures 3-15a and 3-15b illustrates the simulated effect of the Proposed Action on the components of the regional water budget over time. Figure 3-15a separates out impacts to the depletion of storage, the simulated direct effects on discharge to the Rio Grande which is further broken out in Figure 3-15b, and flow across the northern model boundary, some portion of which would have a river impact. The reductions in flow are shown as increasing steadily once mining begins, peaking at the end of mining, then declining fairly rapidly once mining is over, but continuing on for decades. Additional water budget impacts would occur should owners of artesian wells increase their pumping to compensate for decreased artesian flow.

Figure 3-15a. Impacts of Proposed Action on Water Budget



Source: JSAI 2015.

Figure 3-15b. Breakout of "Reduced Discharge" Impact in Figure 3-15a



Source: JSAI 2015.

Note: The term "flowing well" is equivalent to "artesian well."

Streamflow Impacts: Construction of the JSAI model effectively results in almost all streamflow depletions being accounted to the Rio Grande. In Table 3-20a, the maximum impact "to Rio Grande" is 1,464 AFY. Other flow changes in the table may also include a component of Rio Grande impact and the actual maximum river impact could exceed 2,500 AFY. Measures that might be taken by NMCC to mitigate or offset depletion effects are not considered in this quantification.

A simple check on the model was made by computing Rio Grande streamflow effects using an analytical method (Glover-Balmer equation), which is often applied by the New Mexico OSE. The results are consistent with the projections made by the model.

Impacts on Other Components of the Water Budget: Water budget impacts beyond those discussed above would include the following:

- The groundwater model simulates a small subflow in the alluvium along Greyback Arroyo. The simulated impact of the mine pit would be to deplete about 20 AFY of this flow, which in effect would be a permanent reduction in recharge to the Santa Fe Group aquifer.
- ET is a water balance term that represents shallow groundwater directly taken up by riparian or wetland vegetation. Shallow groundwater in riparian areas is often sustained by recharge from streamflow. Riparian vegetation in the model area is at least partly dependent on this groundwater supply and associated streamflow. Areas of such vegetation are shown in green on Figure 3-13a and are largely limited to the Rio Grande corridor, Las Animas Creek, and the upper reaches of Percha Creek in and above Percha Box.
- Mine operations (primarily the production wells) are simulated as causing a small reduction (maximum of 30 AFY) in ET and streamflow in areas of riparian vegetation (See Table 3-20a). Impacts to flow in Upper Las Animas Creek and to Percha Box are each estimated to reach a maximum of 1 to 2 AFY. The lack of impact in riparian areas is further illustrated by flat hydrographs for a location in Percha Box and for a location along Las Animas Creek

where Arizona sycamores are found. (See Appendix E.) Additional small ET impacts would be expected to occur along lower Percha Creek, but the model simulates the creek as flowing in that location, and thus calculates impacts as a reduction in streamflow.

- The model does not simulate existing spring discharges nor does it compute potential changes to those discharges. Based on predictions of where drawdown is simulated to occur, no impacts are predicted to Warm Springs or any springs west of the Animas Uplift. Springs along the alluvial valleys are understood as perched discharges, that is, the local geology is such that the springs are not directly connected to the deep groundwater. Consequently, impacts to such springs are not expected. Bedrock seeps in the immediate area of the mine could be impacted, potentially to the point that flow ceases permanently.

Impacts specific to the tailing ponds and waste rock disposal areas are not addressed in JSAI's regional model. The expected impacts are seepage in small amounts that could locally reduce the amount of drawdown that is now predicted. All such impacts are predicted to be within the mine area.

3.6.2.1.2 Mine Closure/Restoration

Water level recovery would occur after mining ceases. Recovery in the bedrock near the mine pit would be limited. Recovery in the Santa Fe Group would eventually (over decades) be essentially complete. The post-mining water budget is quantified in Table 3-20a, column entitled "Decrease from no mine, 100 yrs after mining" and post-mining water levels are illustrated (along with changes during mining) in Figure 3-14. (See also Figure 3-22.)

3.6.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

3.6.2.2.1 Mine Development and Operation

Refer to Section 3.6.2.1.1 for a general discussion of the tables and figures that illustrate model results.

Alternative 1 is the same as the Proposed Action in the total amount of ore that would be mined and water that would be withdrawn, but different in that the rate of mining would be faster, the duration of mining would be less, and thus well pumping and dewatering would occur at higher rates for a shorter period. Table 3-21 provides the water budget for Alternative 1 in the same format as Table 3-20. Figure 3-16a provides a map showing the drawdown or decline in water levels in the alluvial aquifer (model layer 1) expected to result from Alternative 1. Figure 3-16b is the equivalent drawdown map for the portion of the Santa Fe aquifer that is in model layer 2. Figure 3-16c is a map of drawdowns in layer 2 in addition to those shown in Figure 3-13b, that would occur in the event that private wells in the lower valley of Las Animas Creek were pumped at an additional 930 AFY in order to replace the reduction in artesian flow that would result from the pumping of the NMCC supply wells. Figure 3-17 provides hydrographs showing drawdown in wells GWQ11-26 and PW-1 over time. Figure 3-18 illustrates predicted water depletions over time. Additional hydrographs are provided in Appendix E for locations shown on Figures 3-16a and 3-16b.

The higher mining rate of Alternative 1 is predicted to cause water declines and streamflow depletions to reach their maximum level earlier than for the Proposed Action, with recovery also occurring earlier. The concentration of more pumping in a shorter time would cause higher maximum impacts to the regional water budget. For example, the total water balance depletion "to Rio Grande" from Alternative 1 is 1,742 AFY, but in consideration of other flow changes, the maximum impact could exceed 3,000 AFY. Water level declines at the pit would be essentially the same as for the Proposed Action, but at the well field the declines would reach a maximum of around 60 feet, roughly15 feet more than for the Proposed Action.

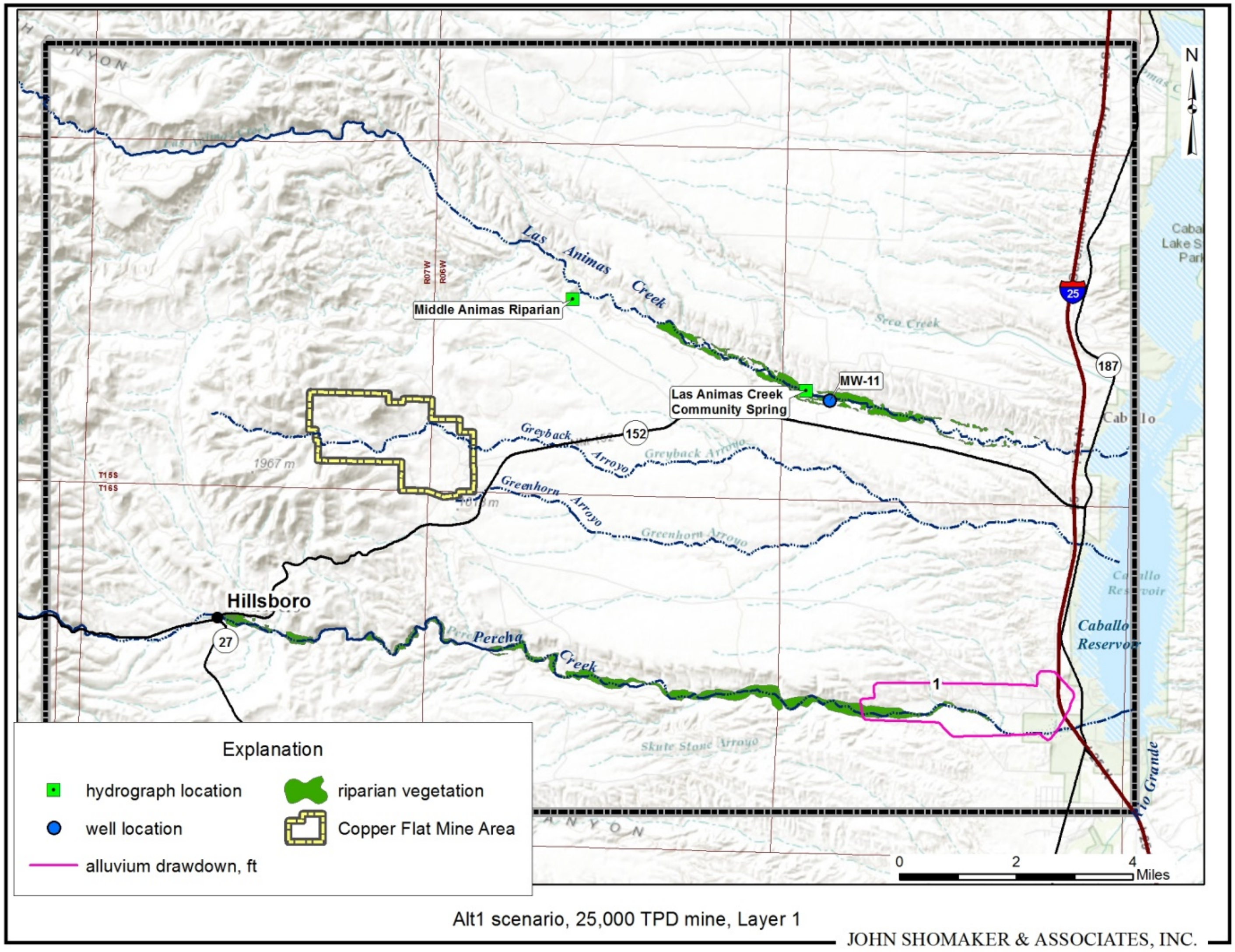
Table 3-21. Regional Water Budget for Alternative 1

Table 3-21a. Change in Flow, Acre-Feet Per Year			
Parameter	**Decrease from No Mine, 3 Months After End of Mining**	**Decrease from No Mine, 100 Years After Mining**	**Flow Rate with No Mine**
Groundwater discharge to Rio Grande above Caballo Dam	939	22	10,561
Groundwater discharge to Rio Grande below Caballo Dam	803	3	1,234
Discharge from flowing wells	930	4	2,030
Animas Creek ET and flow reduction	14	1	4,848
Percha Creek ET and flow reduction	20	3	2,630
Inflow from graben north of model area	566	3	2,184
Total change in flow terms	**3,272**	**36**	

Table 3-21b. Cumulated Change in Volume from Well Field and Pit Drainage, Acre-Feet	
Parameter	**Volume Change 3 Months Post-mining (AF)**
Storage	34,052
Rio Grande above Caballo Dam	6,934
Rio Grande below Caballo Dam	5,533
Flowing wells	6,954
Animas Creek flow and ET	113
Percha Creek flow and ET	134
Inflow from graben north of study area	4,510
Total	**58,230**

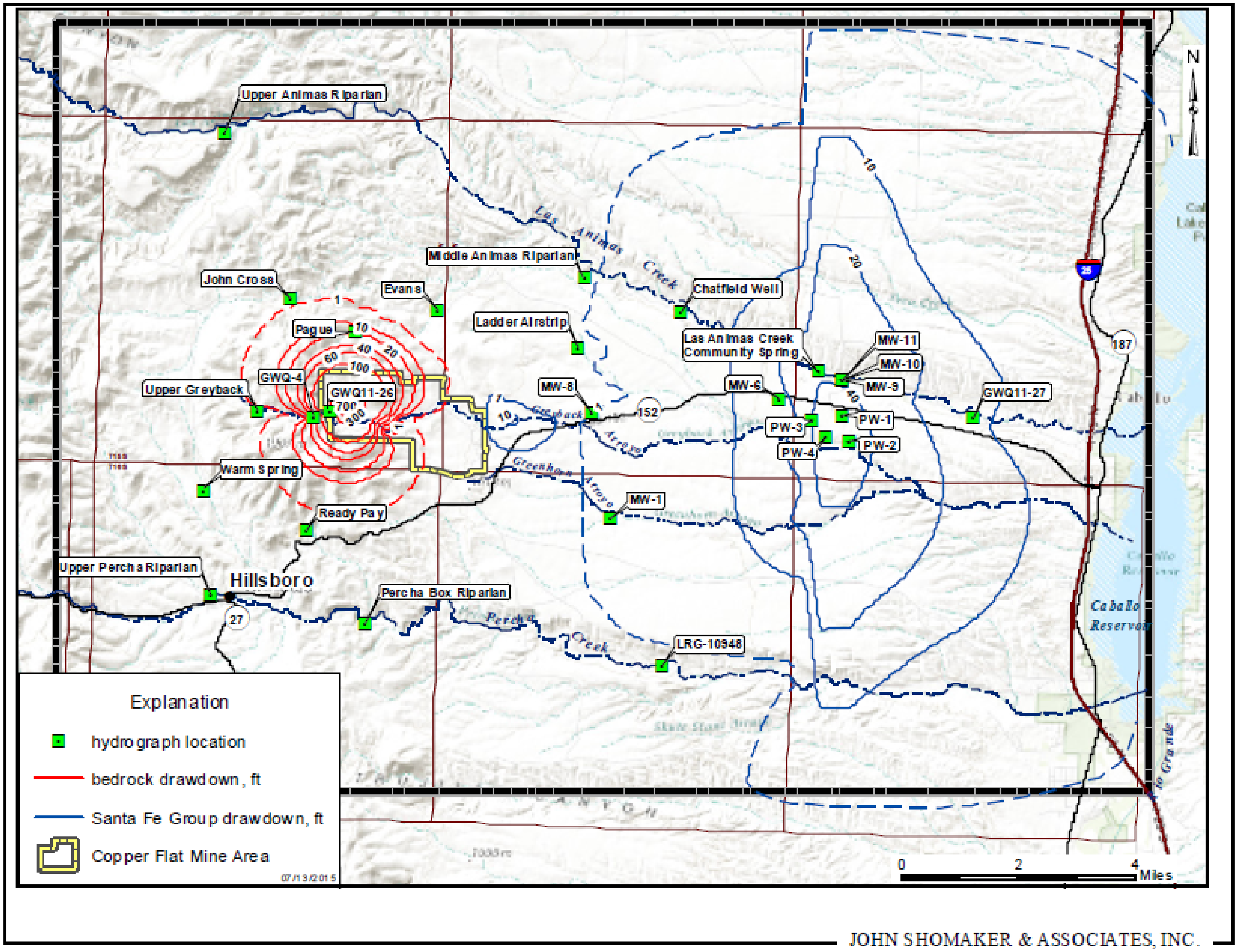
The storage change in Table 3-21b includes 466 AF of drainage to the pit; the remainder is the effect of the supply well pumping. The total modeled volume change of 58,230 AFY is in acceptably close agreement with the projected sum of pumping and pit drainage of 58,260 AF in Table 3-19.

Figure 3-16a. Map of Water Level Declines in Layer 1 at End of Mining – Alternative 1



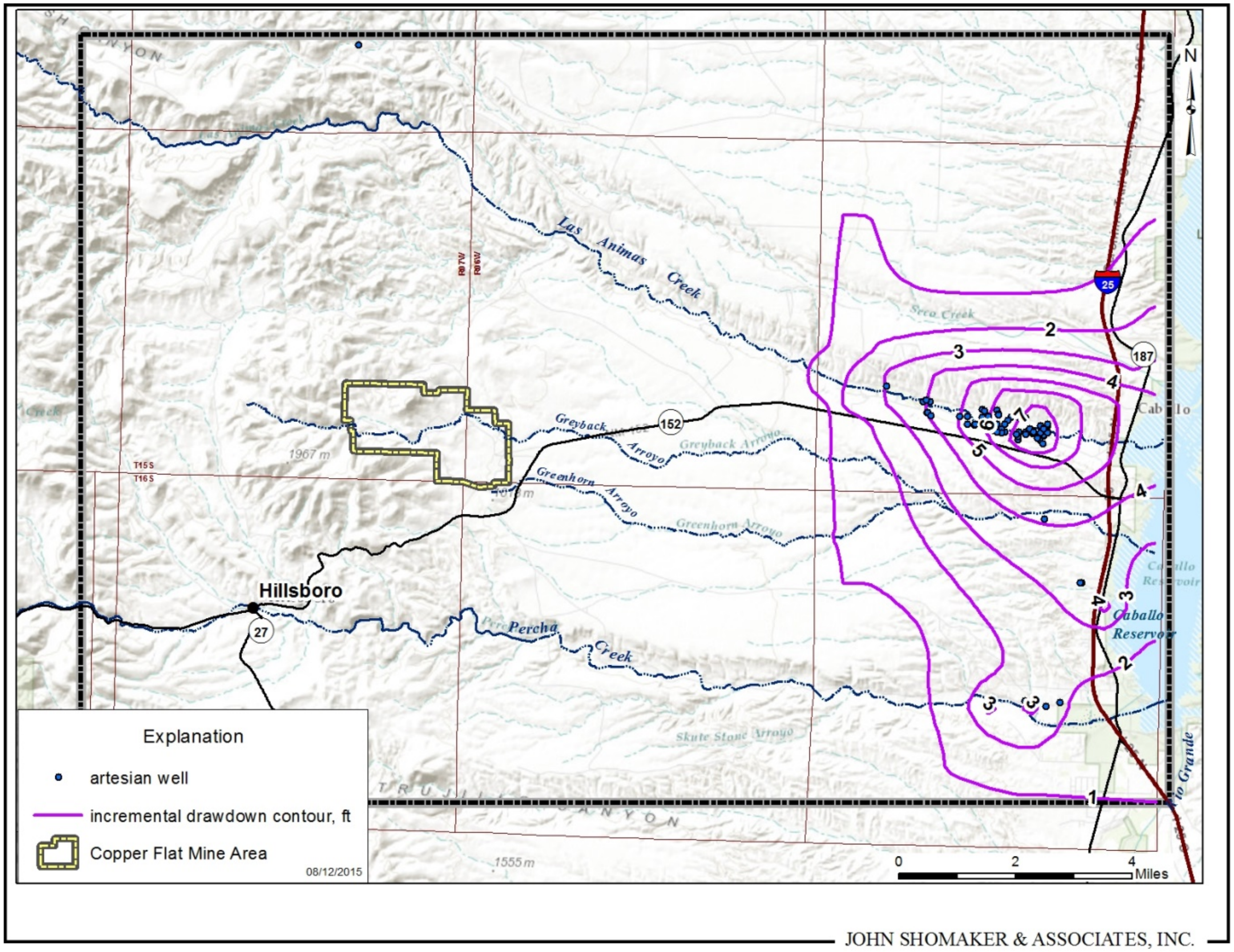
Source: JSAI 2015.

Figure 3-16b. Map of Water Level Declines in Layer 2 at End of Mining – Alternative 1



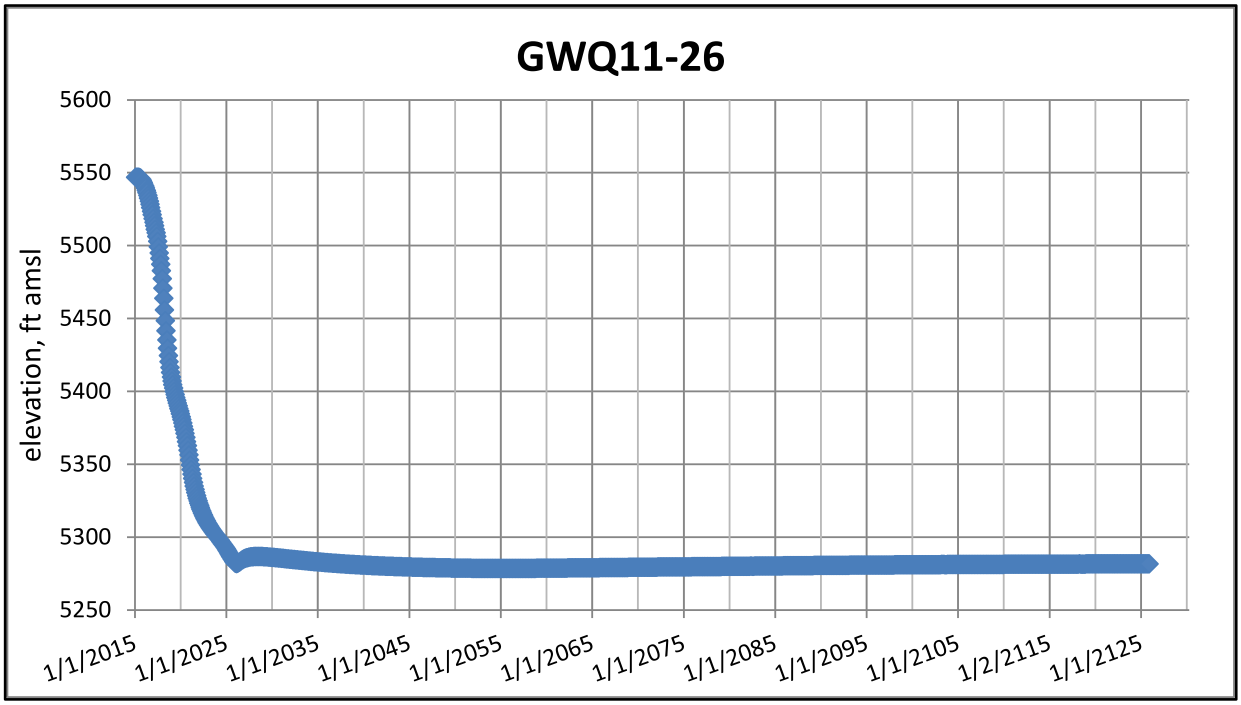
Source: JSAI 2015.

Figure 3-16c. Map of Water Level Declines in Layer 2 at End of Mining, Alternative 1, Resulting From Potential Increased Pumping of Artesian Wells



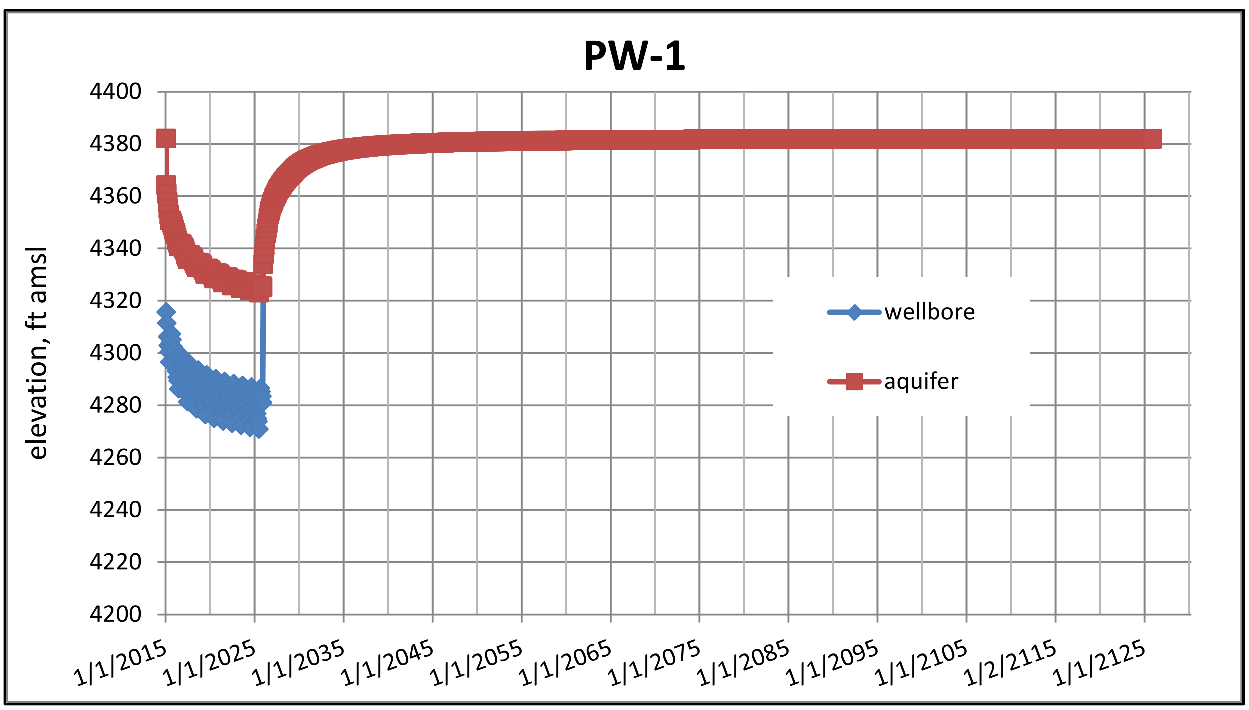
Source: JSAI 2015.

Figure 3-17a. Projected Water Level at GWQ11-26 – Alternative 1



Source: JSAI 2014.

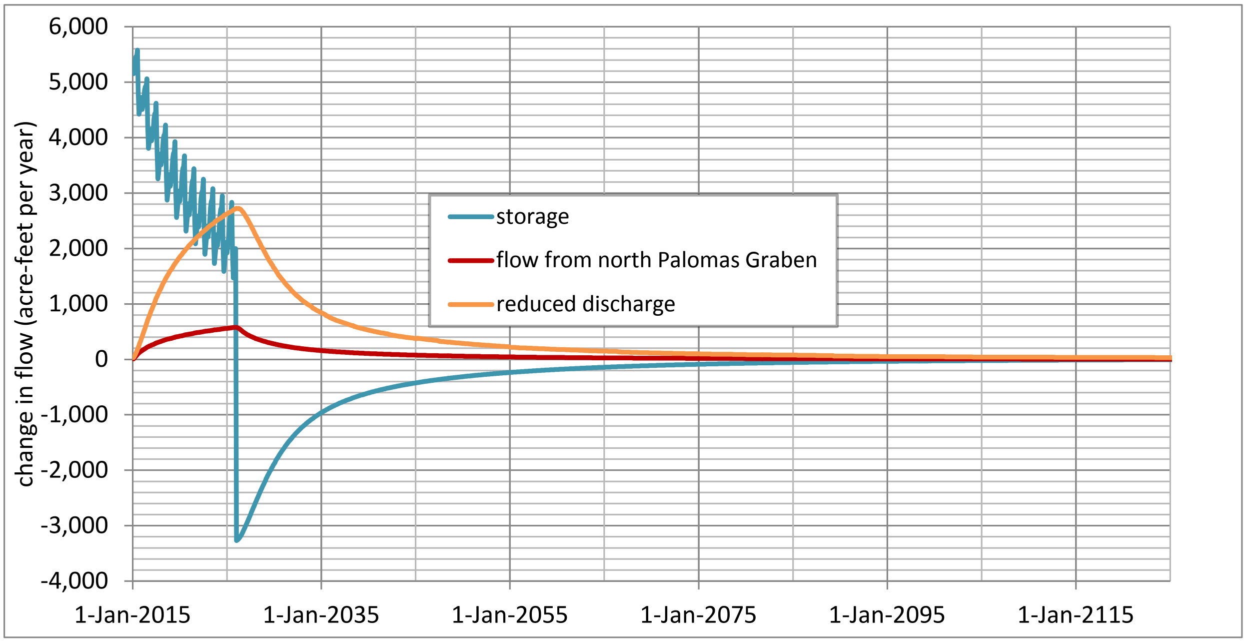
Figure 3-17b. Projected Water Level at PW-1 – Alternative 1



Source: JSAI 2014.

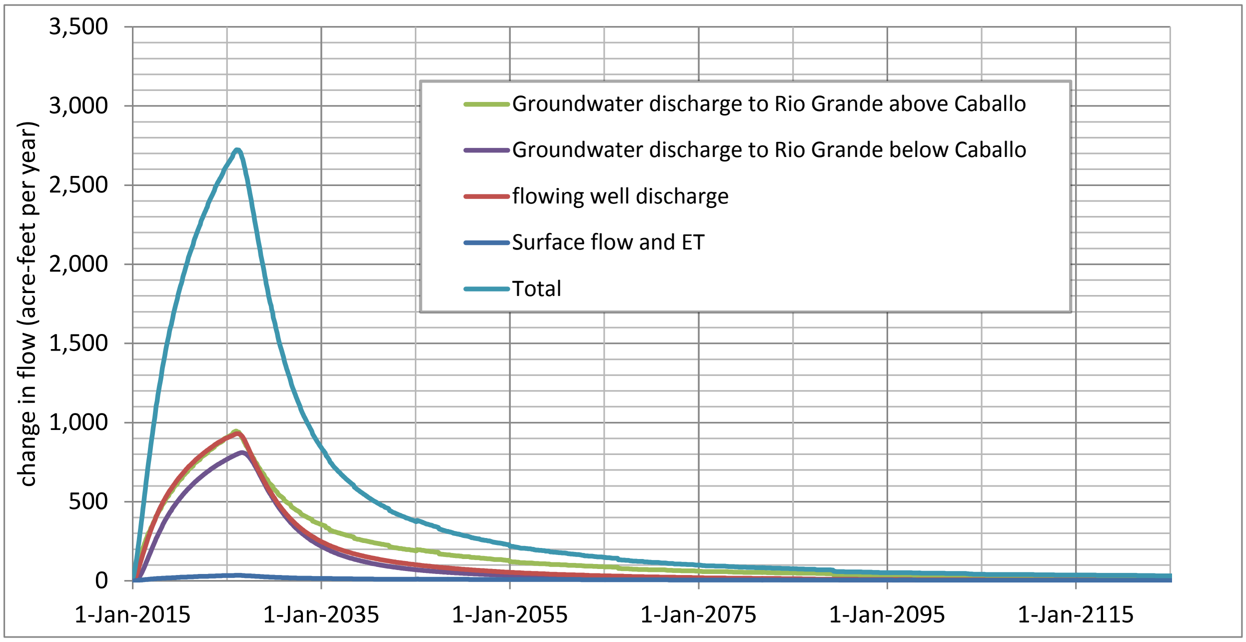
Impacts to Regional Water Budget: Figure 3-18a illustrates the simulated effect of Alternative 1 on the components of the regional water budget over time. The impacts are generally greater and peak earlier than for the Proposed Action.

Figure 3-18a. Impacts of Alternative 1 on Water Balance Components



Source: JSAI 2015.

Figure 3-18b. Breakout of "Reduced Discharge" Impact in Figure 3-18a



Source: JSAI 2015.

3.6.2.2.2 Mine Closure/Restoration

Water level recovery would occur after mining ceases. Recovery in the bedrock near the mine pit will be limited. Recovery in the Santa Fe Group will eventually (over decades) be complete. The post-mining water budget is quantified in the Table 3-20a, column entitled "Decrease from no mine, 100 yrs after mining", and post-mining water levels are illustrated (along with changes during mining) in Figure 3-17. (See also Figure 3-22.).

3.6.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

3.6.2.3.1 Mine Development and Operation

Refer to Section 3.6.2.1.1 for a general discussion of the tables and figures that illustrate model results.

Alternative 2 would entail higher groundwater pumping rates than the Proposed Action or Alternative 1, and an intermediate timeframe. Table 3-22 provides the water budget for Alternative 2 in the same format as Tables 3-20 and 3-21. Figure 3-19a provides a map showing the drawdown or decline in water levels in the alluvial aquifer (model layer 1) expected to result from Alternative 2. Figure 3-19b is the equivalent drawdown map for the portion of the Santa Fe aquifer that is in model layer 2. Figure 3-19c is map of drawdowns in layer 2 in addition to those shown in Figure 3-19b, that would occur in the event that private wells in the lower valley of Las Animas Creek were pumped at an additional 1,054 AFY in order to replace the reduction in artesian flow that would result from the pumping of the NMCC supply wells. Figures 3-19a through 3-19c illustrate regional water budget depletions over time. Figures 3-20a and 3-20b provide hydrographs showing drawdown in wells GWQ11-26 and PW-1. Additional hydrographs are provided in Appendix E.

As expected, Alternative 2 would have a larger impact than the Proposed Action and Alternative 1. The maximum impact "to Rio Grande" is 2,025 AFY, but in consideration of other flow changes, the maximum impact could exceed 3,500 AFY. Water level declines at the pit would be essentially the same as for the Proposed Action, but at the well field the declines would exceed 70 feet, the greatest of the alternatives evaluated.

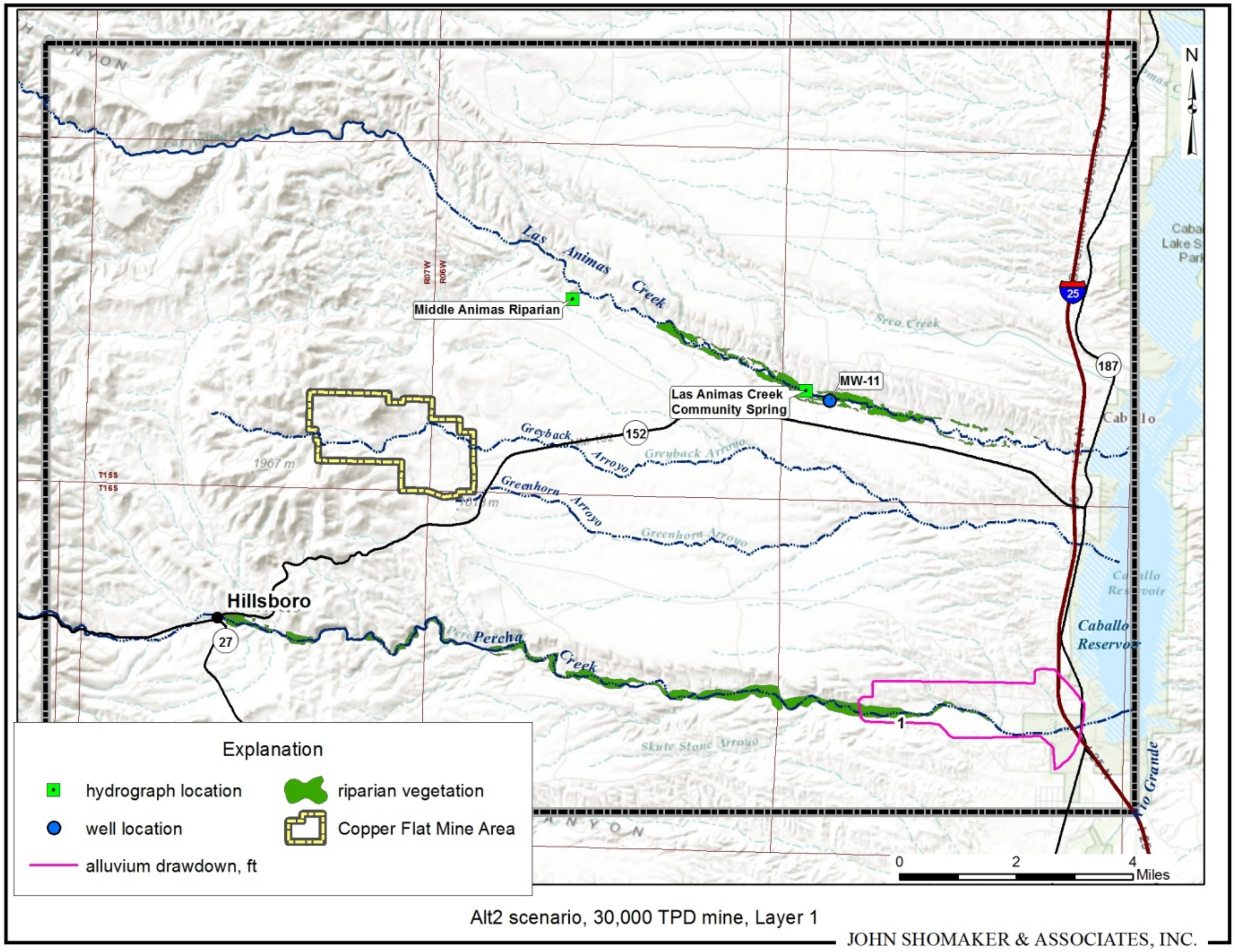
Table 3-22. Regional Water Balance for Alternative 2

Table 3-22a. Change in Flow, Acre-Feet Per Year			
Parameter	**Decrease from no mine, 3 months after end of mining**	**Decrease from no mine, 100 yrs after mining**	**Flow Rate with No Mine**
Groundwater discharge to Rio Grande above Caballo Dam	1,093	25	10,561
Groundwater discharge to Rio Grande below Caballo Dam	932	3	1,234
Discharge from flowing wells	1,054	4	2,030
Animas Creek ET and flow reduction	17	1	4,848
Percha Creek ET and flow reduction	24	4	2,630
Inflow from graben north of model area	665	3	2,184
Total change in flow terms	**3,785**	**40**	

Table 3-22b. Cumulated Change in Volume, Acre-Feet	
Parameter	**Volume Change Post-mining (AF)**
Storage	40,955
Rio Grande above Caballo Dam	8,353
Rio Grande below Caballo Dam	6,730
Flowing wells	8,338
Animas Creek flow and ET	136
Percha Creek flow and ET	165
Inflow from graben north of model area	5,493
Total	**70,210**

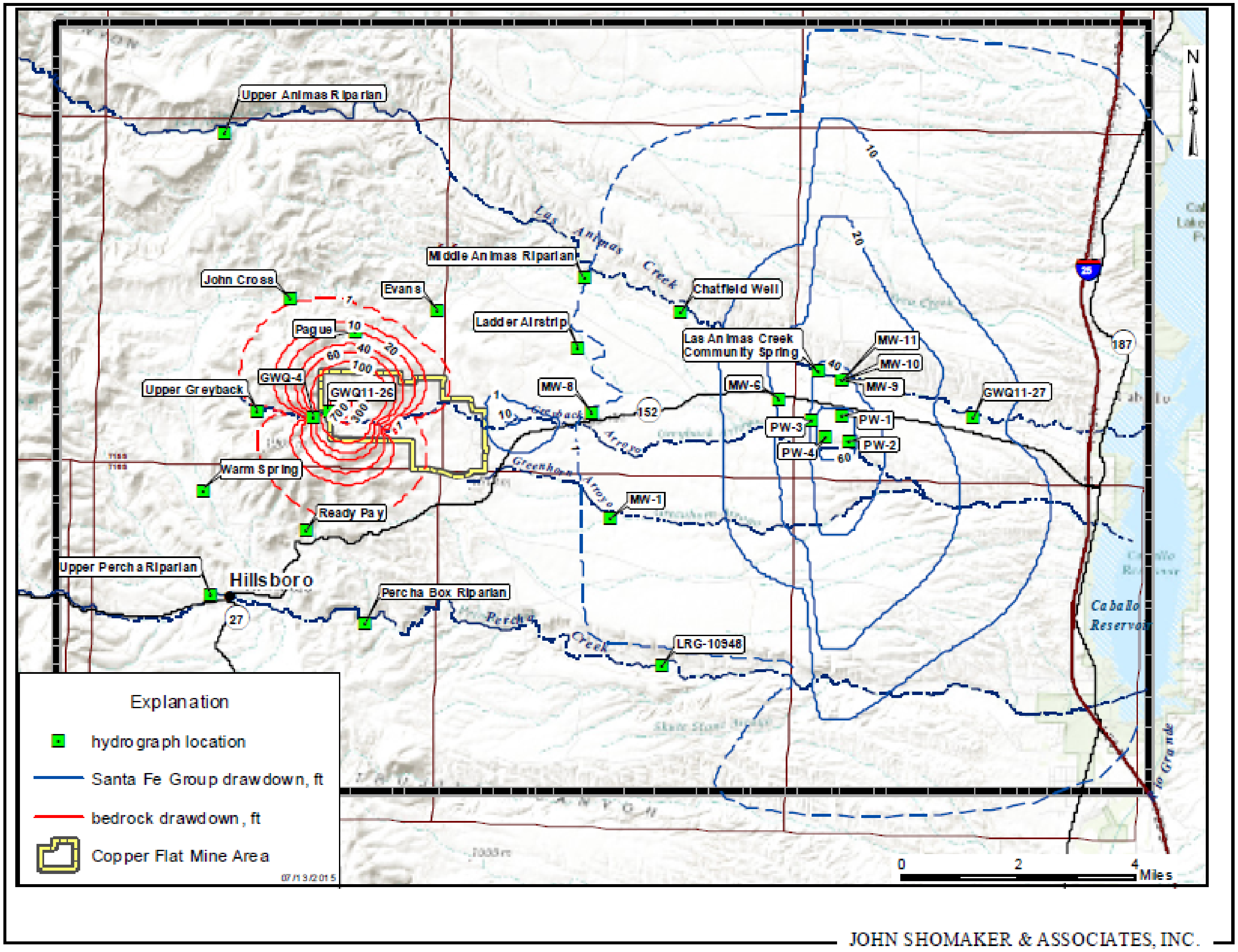
The storage change in Table 3-22b includes 489 AF of drainage to the pit; the remainder is the effect of the supply well pumping. The total modeled volume change of 70,210 AFY is in acceptably close agreement with projected sum of pumping and pit drainage of 70,239 AF in Table 3-19.

Figure 3-19a. Map of Water Level Declines in Layer 1 at End of Mining – Alternative 2



Source: JSAI 2015.

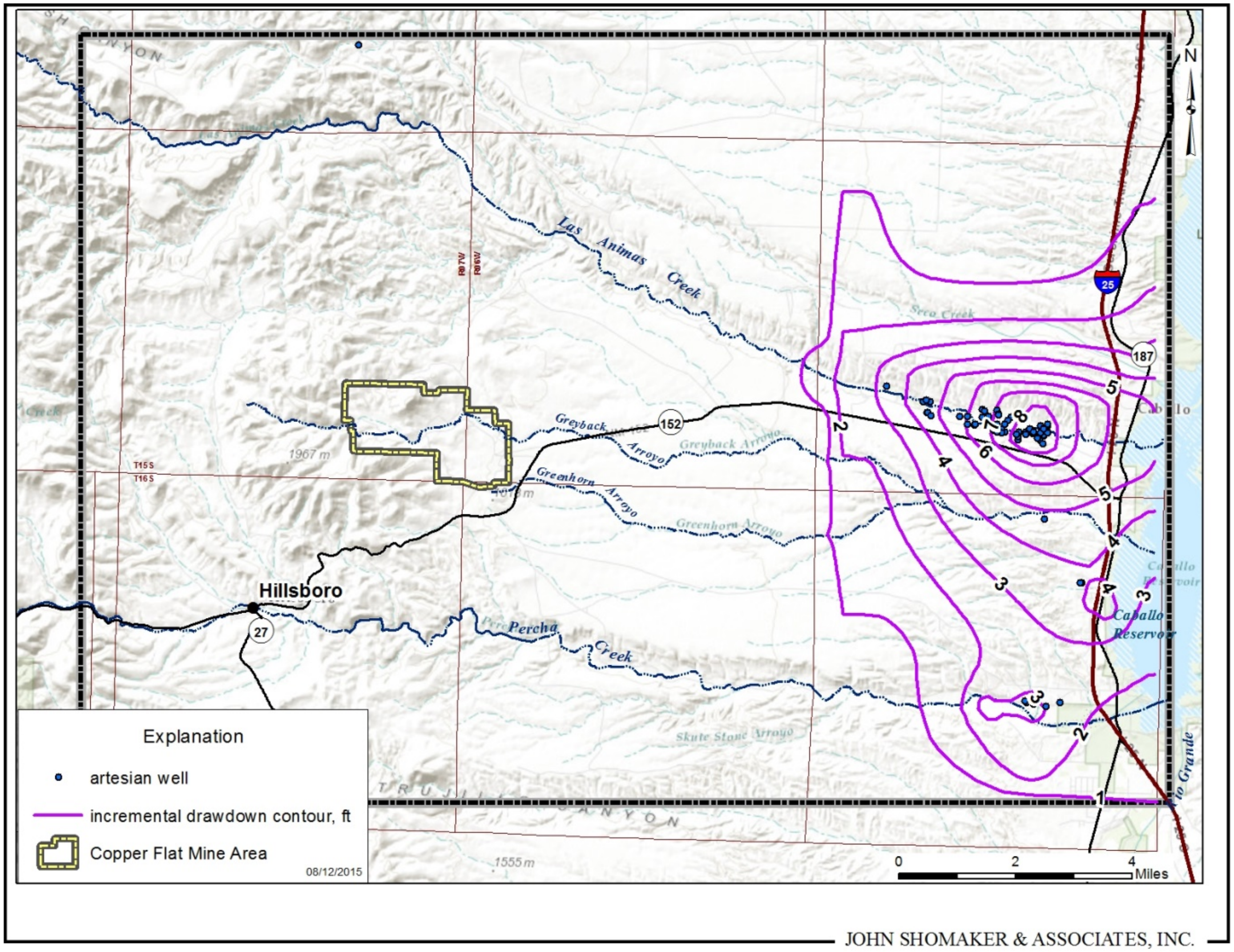
Figure 3-19b. Map of Water Level Declines in Layer 2 at End of Mining – Alternative 2



JOHN SHOMAKER & ASSOCIATES, INC.

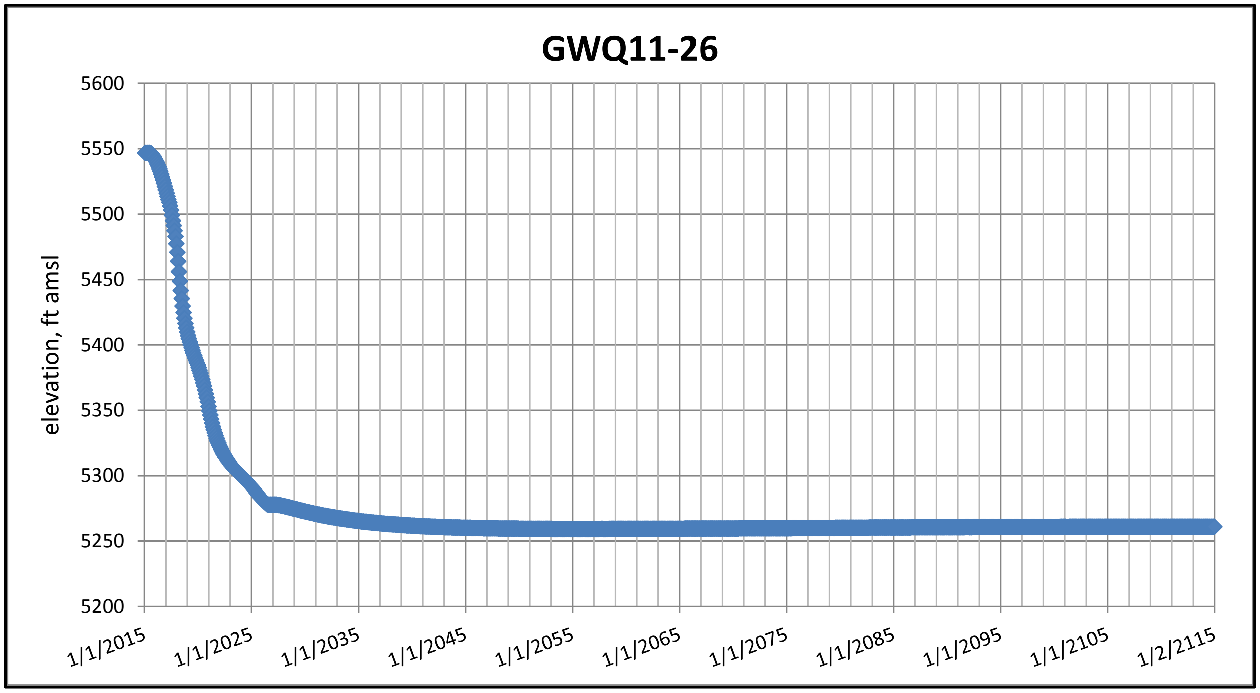
Source: JSAI 2015.

Figure 3-19c. Map of Water Level Declines in Layer 2 at End of Mining, Alternative 2, Resulting From Potential Increased Pumping of Artesian Wells



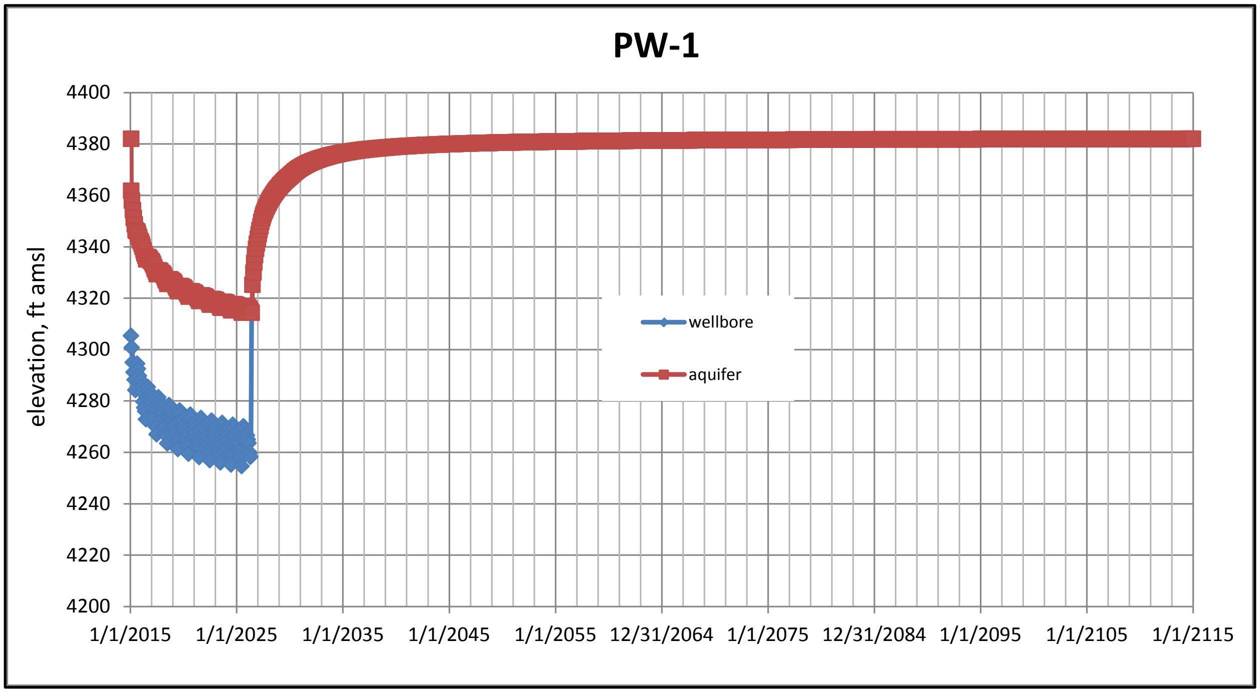
Source: JSAI 2015.

Figure 3-20a. Projected Water Level at GWQ11-26 – Alternative 2



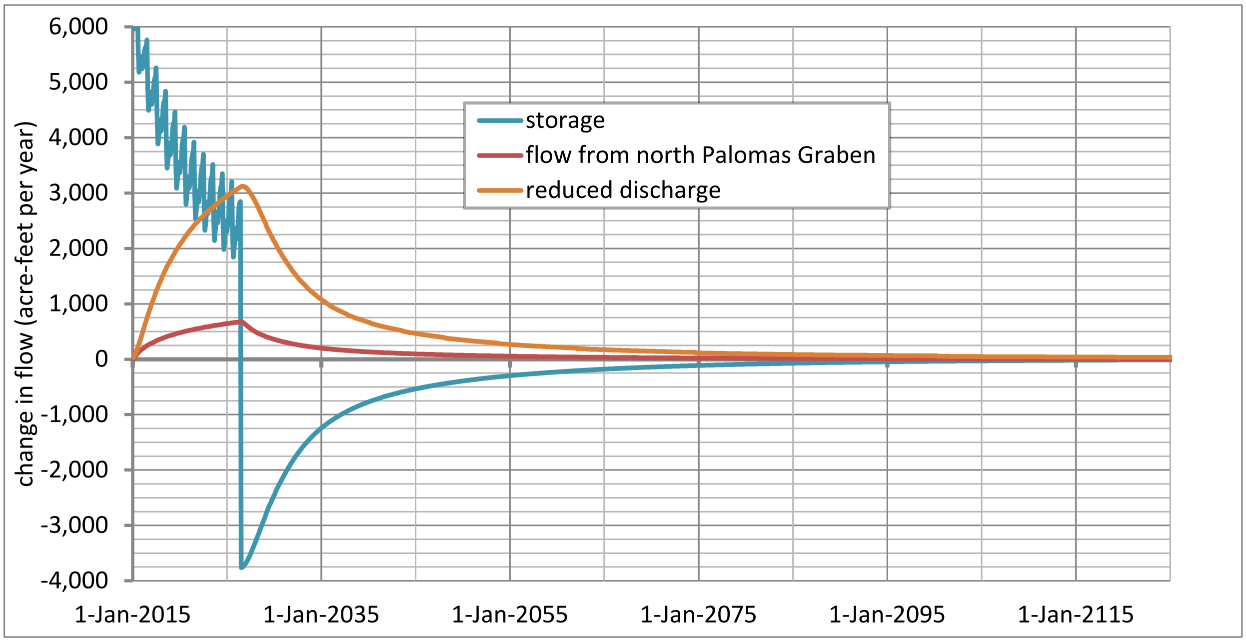
Source: JSAI 2014.

Figure 3-20b. Projected Water Level at PW-1 – Alternative 2



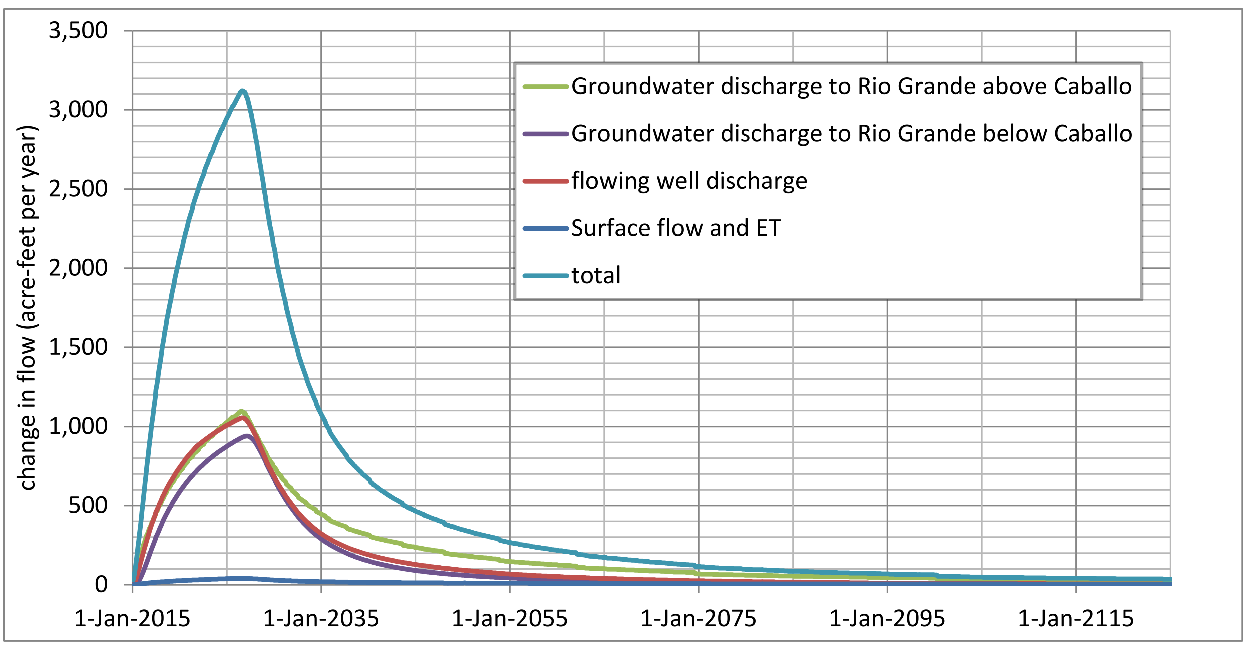
Source: JSAI 2014.

Figure 3-21a. Impacts of Alternative 2 on Water Balance Components



Source: JSAI 2015.

Figure 3-21b. Breakout of "Reduced Discharge" Impact in Figure 3-21a



Source: JSAI 2015.

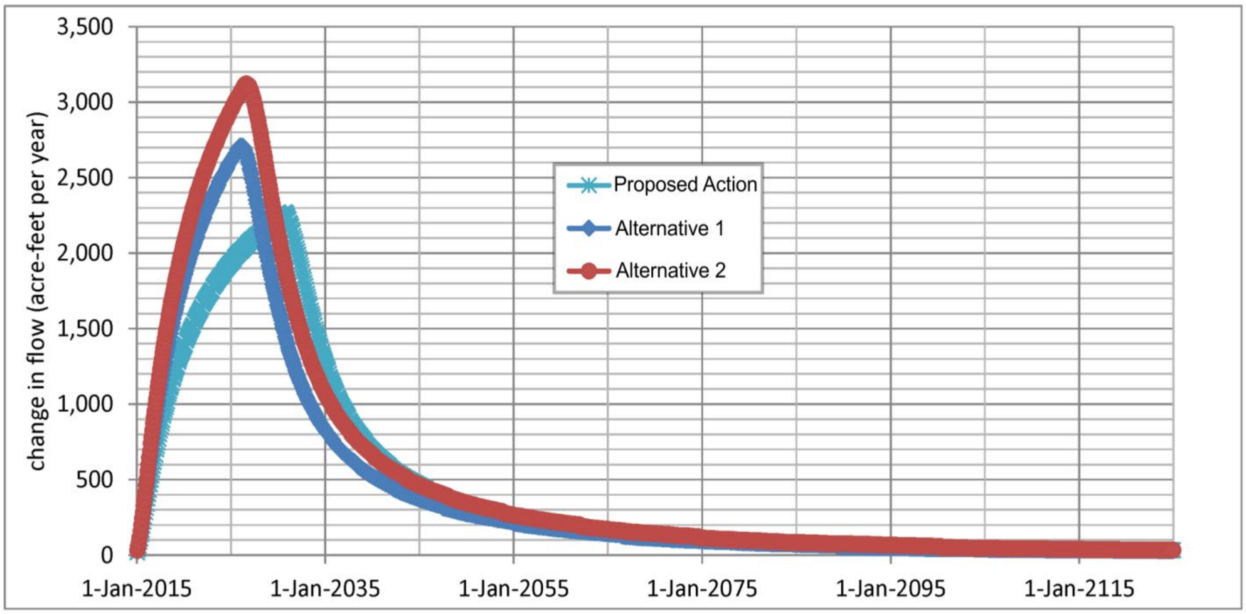
3.6.2.3.2 Mine Closure/Restoration

Water level recovery would occur after mining ceases. Recovery in the bedrock near the mine pit would be limited. Recovery in the Santa Fe Group would eventually (over decades) be complete. The post-mining water budget is quantified in the Table 3-22a column entitled "Decrease from no mine, 100 yrs after mining" and post-mining water levels are illustrated (along with changes during mining) in Figures 3-19a through 3-19c. (See also Figure 3-22.).

3.6.2.3.3 Summary of Groundwater Assessment

Comparison of Alternatives: The alternatives differ primarily as to the timing and rate at which the regional water budgets would be affected. Figure 3-22 compares the three alternatives with respect to total changes in (depletions of) flow, which are mostly reduced flow to the Rio Grande and reduced flow of artesian wells. The time signal of impacts is similar, in that impacts would increase rapidly once mining begins, and decline rapidly once mining ends. Peak depletions would occur later for the Proposed Action than for the alternatives because the pace of mining in the Proposed Action would be slower. In all alternatives the impact to flow depletions is a large share of total pumping. The largest peak impact shown in Figure 3-22 is from Alternative 2; the smallest from the Proposed Action.

Figure 3-22. Comparison of Total Regional Water Budget Impacts of Alternatives



Source: JSAI 2014.

Confidence in Predictions of Impacts: The choice of a model used to predict impacts to groundwater is only partially constrained by data, and the resulting estimates of effects are necessarily approximate. However, the general character and magnitude of impacts is reasonably known.

- A deeper mine pit would require dewatering and lowering of groundwater levels near the mine. Impacts of a deeper mine pit would be limited because the ore body is embedded in relatively impermeable bedrock. This is shown by the past history of the Quintana mine, and by aquifer tests.
- Pumping of the supply wells would lead to lowering of water levels and to a reduction in stream flows. These predicted impacts are consistent with observations of effects of wells that draw from the Santa Fe Group throughout the Rio Grande Valley of New Mexico.

Sensitivity tests provided in Appendix F indicate the range of predicted impacts based on certain changes to the model. These tests confirm that the model provides a reasonable evaluation of impacts, even if the details may include a degree of uncertainty.

Significance of Impacts: Impacts to the regional water budget, including flows of the Rio Grande, would be significant. These impacts would be large in magnitude, long-term, and certain. Water budget impacts would begin to reduce once mining ends.

Impacts to water levels caused by the supply well field would be significant. These impacts would be certain, but the magnitude would be moderate in comparison to the thickness of the aquifer. Regional drawdown impacts would begin to reduce once mining stops.
Impacts to water levels caused by the pit would also be significant. These effects would be large in magnitude, permanent, and certain, but small in areal extent.

3.6.2.4 No Action Alternative

Compared to existing conditions, there would be no change in the regional water budget from mining if the project is not implemented. Some water would continue to be depleted due to evaporation from the mine pit, and a drawdown cone would continue to exist around that pit. Hydrologic effects from abatement of contamination at the existing tailings ponds would occur as directed by the State of New Mexico.

3.6.3 Mitigation Measures

The BLM EIS team coordinated with the agencies that have direct permitting oversight of the Copper Flat mine at the State level. In September 2014, the BLM consulted with the NMED and OSE with specific reference to potential well monitoring programs that would be used to evaluate and manage actual mine impacts.

The NMED already requires monitoring in the area of the mine pit, primarily for purposes of water quality abatement. OSE already has access to a USGS monitoring program for the Las Animas Creek area, which provides periodic measurements of water levels in scattered wells. NMCC gathers data from its own monitoring wells near the pit and supply well field. Both State agencies are expected to require NMCC to conduct additional monitoring, but no specifics on such future monitoring are currently available.

Both the NMED and OSE have the authority to require mitigation of impacts that are judged unacceptable in accordance with New Mexico regulations. The BLM intends to rely on the State agencies to exercise their statutory authority in determining which impacts exceed allowable limits, and what mitigation measures may be required. At this time, no permitting decisions have been made, and there are no draft proposals regarding mitigation that may be required by the State of New Mexico.

3.7 MINERAL AND GEOLOGIC RESOURCES

3.7.1 Affected Environment

The information base for describing the geology of the project area is extensive, and much of it is best presented in the context of specific impact issues, such as groundwater use or quality. The regional context for those resource-specific discussions is presented below and is based primarily on the following references: Wilson et al. (1981); Seager et al. (1984); Dunn (1982); BLM (1999); JSAI (2011); Intera (2012); and Jones et al. (2012). The geologic history of the area and the associated mineralization are summarized below. (See Table 3-23.)

3.7.1.1 Regional Geologic Setting

The project is located on the western margin of the Rio Grande Rift, the easternmost region of the Basin and Range geologic and topographic province that characterizes much of the southwestern United States. The Rift is a relatively young north-south geologic structure that bisects New Mexico and extends from southern Colorado to western Texas. Throughout most of the Rift length, a thick volume of sediments have been deposited within a series of down-faulted troughs. These sediments were eroded from adjacent mountains, such as the Animas Uplift, or carried by the ancestral Rio Grande. The basin fill sediments in the Rift are referred to as the Santa Fe Group. The Rift materials have been extensively affected by internal faulting and by volcanic activity.

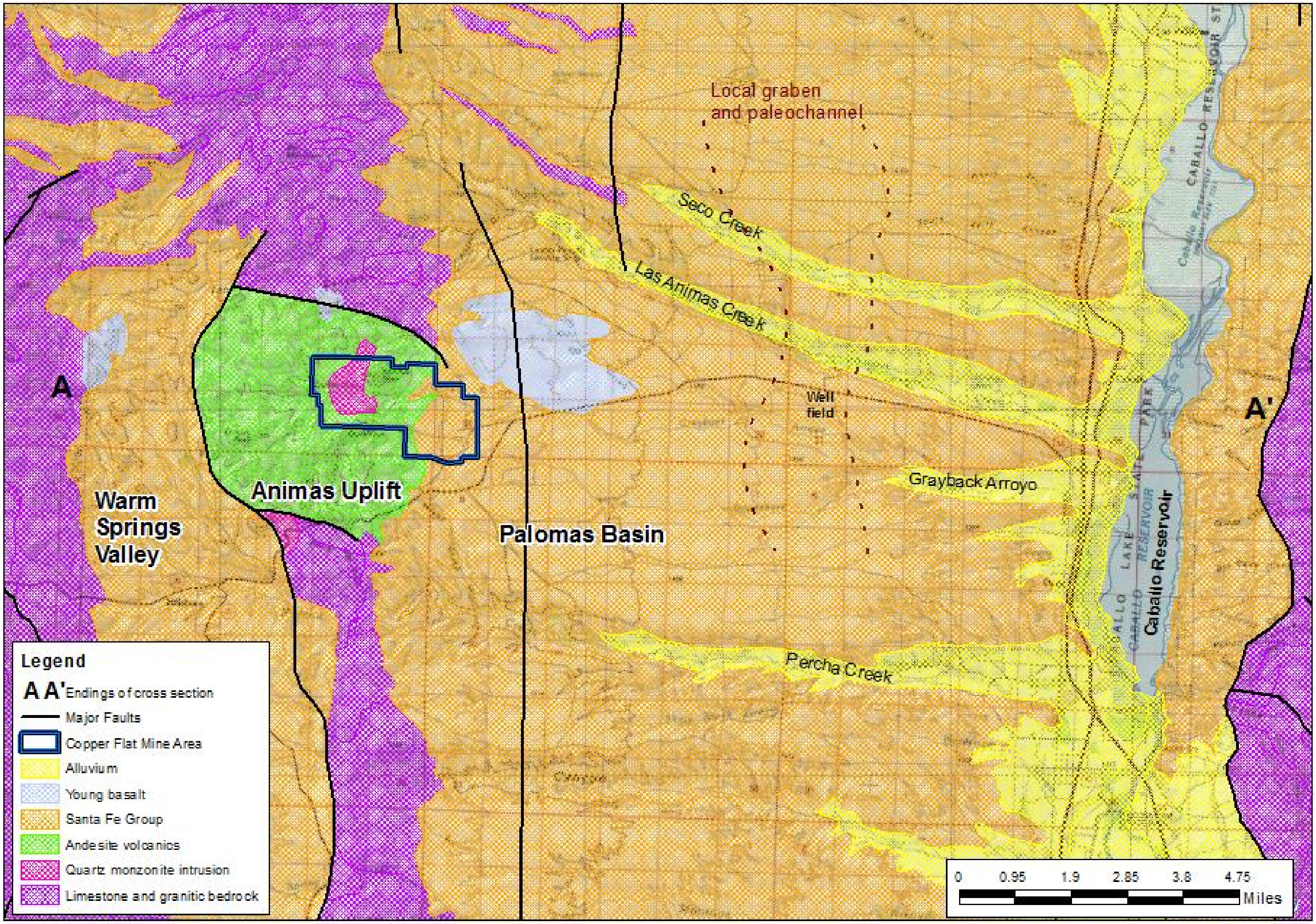
Three north-south trending geologic zones are located in the project area. (See Figure 3-23.) West to east, these three zones are the Warm Springs Valley, Animas Uplift, and Palomas Basin. Alluvial valleys that drain toward the Rio Grande represent a fourth geologic zone in the area. (See Figure 3-24.) More detailed maps and cross-sections are provided in BLM 1999.

Table 3-23. Geologic History of the Copper Flat District

Geologic Time (in millions of years before present)	Geologic Settings	Mineralization
Precambrian Era (570-1500)	Metamorphism and intrusion of granites	Not mineralized in project area.
Paleozoic Era (225-570)	Deposition of marine and near-shore clastic and carbonate sediments in bank, platform, and deltaic environments. Limestone and dolomites dominate with lesser shales and evaporites.	Not mineralized during this time period – mineralized during the Cretaceous.
Mesozoic Era (65-225)	Early deposition of shales and sandstones followed by extensive andesitic volcanism, plutonism, and formation of porphyry copper deposits from Arizona to southcentral New Mexico	Extensive mineralization of the andesites and especially the porphyritic intrusives associated with the andesites. Copper and gold/silver mineralization at Copper Flat. Minor lead and zinc replacement mineralization of Paleozoic carbonate rocks near Hillsboro and upper Percha Creek (the Box).
Cenozoic Era (0-65) **Early-Middle Tertiary** (25-40)	Development of large volcanic cauldrons and eruption of extensive volcanic fields of lava and ash. Formation of Emory and Good Sight-Cedar Hills Cauldrons.	Mineralization in gold and silver along ring faults of large cauldrons. Formation of Kingston, Fairview, and Chloride districts.
Late Tertiary (10-25)	Inception of rifting in the Rio Grande Valley. Formation of the present rift valley structure and the Palomas Basin. Deposition of the Rincon Valley Formation of the Santa Fe Group.	No mineralization.
Late Tertiary-Quaternary (1-10)	Entrenchment of the Rio Grande due to renewed rifting. Deposition of the Palomas Formation alluvial fan gravels and sands. Formation of a paleo-graben within Palomas Basin between Copper Flat and Rio Grande.	Formation of the Las Animas placer gold deposits in Greyback Arroyo and Dutch and Hunkidori Gulches.
Quaternary (0-1)	Continued downcutting of streams that flow to the Rio Grande. Formation of paleo-stream terraces and recent stream deposits.	No mineralization.

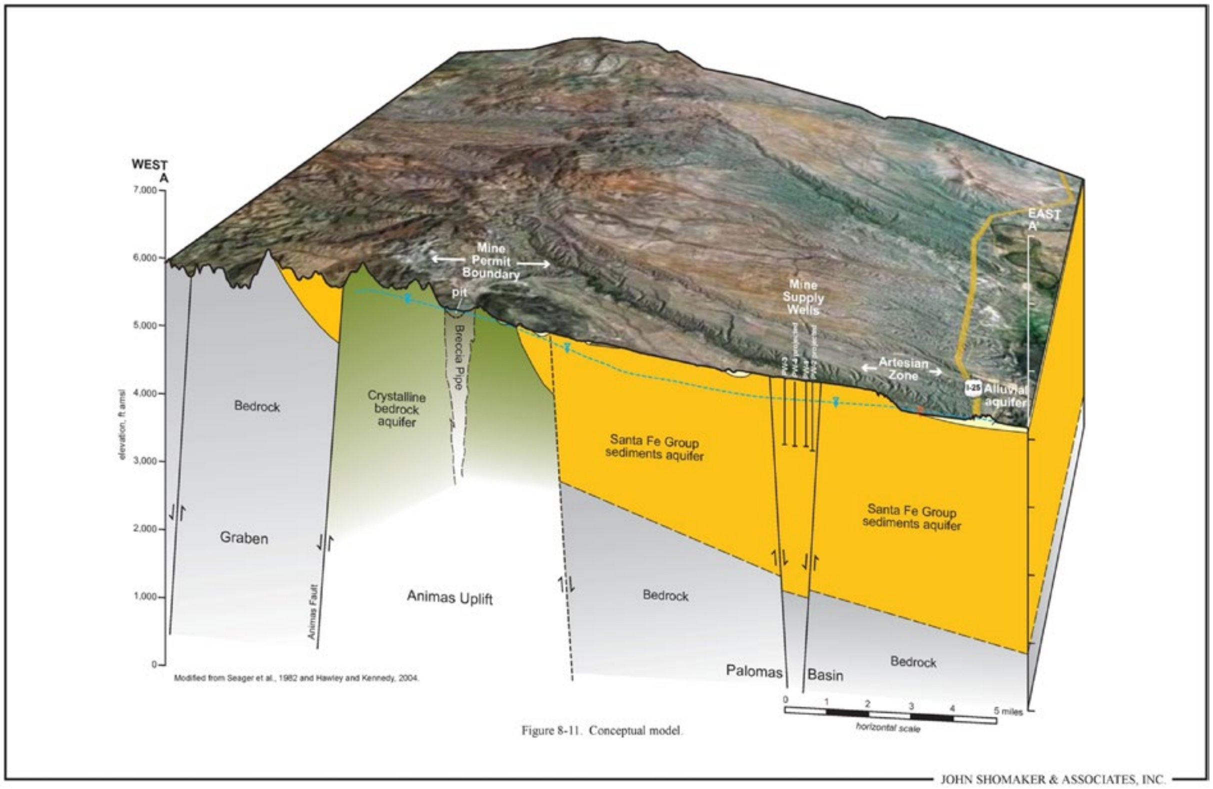
Source: BLM 1999.

Figure 3-23. Geologic Map of Project Area



Source: Modified From JSAI 2012 and Seager et al. 1982.

Figure 3-24. Simplified Geologic Cross Section



Source: Modified from Intera 2012, Figure 8-11.

Warm Springs Valley: Warm Springs Valley occupies a tilted and partially down-faulted geologic zone (a "half-graben") that lies between the Black Range Mountains on the west and the Animas Uplift on the east. The half-graben is up to 4 miles wide and is filled with alluvial sediments of the Santa Fe Group that overlay older sedimentary and igneous rocks. These sediments have a substantial dip eastward toward the Animas horst as a result of faulting on the east side of the graben.

Animas Uplift: The Copper Flat ore body is located within the Animas Uplift, which is a raised fault block (or "horst") that creates the Animas Hills. The fault block is about 2 to 4 miles wide and, as shown on the map and cross-section, is bounded on both sides by near vertical north-south trending normal faults. Within the uplift, remnants of a Cretaceous age volcano about 4 miles in diameter and at least 3,000 feet deep serve as the primary host rock for the igneous intrusions in which copper mineralization occurs. Volcanic rocks (e.g., andesite) associated with the intrusive event surround the volcanic core; older limestone occurs farther north and south. The Cretaceous volcanic activity occurred approximately 75 million years before present. The faulting that uplifted the area and juxtaposed sedimentary rocks against igneous rocks began about 25-30 million years before present.

Palomas Basin: The Palomas Basin extends east from the Animas Uplift about 20 miles with the area of interest for this EIS being the 13 miles from the Uplift to Caballo Reservoir on the Rio Grande. The Palomas Basin is a typical basin ("graben") along the rift and contains a thick sequence (several thousand feet) of alluvial sediments that are typical of the Santa Fe Group. Older bedrock occurs beneath the Santa Fe Group. The Santa Fe sediments are dominated by old alluvial fan deposits that originate from the west and that grade into increasingly fine (clay) materials to the east. Well-sorted axial river sands and gravels occur near the Rio Grande. The Santa Fe Group materials are stratified and in general dip to the east. In some locations, volcanic basalts occur within or atop the Santa Fe Group sediments. Faulting is common within the sediments of the Palomas Basin.

Alluvial Valleys: In addition to the 3 north-south geologic zones described above, there are several west-to-east arroyos or valleys which contain thin (up to 50 feet thickness) deposits of modern alluvium. These include Greyback Arroyo, which runs through the project site, as well as the drainages of Las Animas Creek to the north and Percha Creek to the south. Sediments in these tributary valleys include channel and floodplain gravels, sands, and silts. Old stream terrace deposits parallel and cap the uplands along many of the drainages. Placer gold has been found at the base of some of these deposits. Thicker (up to a few hundred feet) alluvium trends north to south along the Rio Grande.

3.7.1.2 Mine Area Mineral Resources

McLemore (2001) provides considerable technical detail on the Copper Flat ore deposits. The Cretaceous age volcano that is part of the Animas Uplift is the host rock for the Copper Flat ore body. It lies along a structural lineament that extends to Arizona and along which many other copper deposits are located.

The copper mineralization at Copper Flat is concentrated within a quartz monzonite porphyry that intruded the volcanic vent (in geologic terms, the quartz monzonite rocks are a “stock”). The highest grade ore is found in a breccia pipe (a chimney like structure filled with angular rock fragments) that is near the center of this intrusion. The pipe has been extensively explored with core holes, and is mapped at the land surface as less than 20 acres in extent, and extending more or less vertically to a depth of at least 1,000 feet. Based on analogies to copper deposits elsewhere, the breccia intrusion penetrated upwards to within 1-2 km below the surface of the then active volcano, and has since been exhumed through erosion of the overlying rocks.

Dikes and mineralized veins that intruded the old volcano radiate out from the breccia pipe along faults and fracture zones; these are mostly oriented northeast-southwest. The veins are locally ore-bearing and have been a primary target of mining in the historic Hillsboro Mining District.

Mineralization related to the intrusion consists chiefly of pyrite (iron sulfide) and chalcopyrite (copper iron sulfide), with lesser amounts of molybdenite and trace amounts of galena and sphalerite. The deposit contains appreciable amounts of silver, gold, and molybdenum. Non-ore minerals present from the original stock include quartz and calcite. The ore body rocks have been eroded to create a topographic low (Copper Flat). Prior to mining, a thin layer of soil and debris (“colluvium”) overlay the volcanic bedrock; this is still present in unmined areas.

A relatively thin (20- to 50-foot) cap of leached and oxidized rock was reported to overlie the ore body. This material was stripped during mining activities conducted by Quintana in the early 1980s, and disposed of in waste piles at the mine area. The remaining ore is primarily unoxidized with little secondary enrichment.

3.7.1.3 Earthquake Hazards

The Rio Grande Rift is a zone of moderate seismicity, with frequent small to moderate earthquakes observed in the Socorro area. The BLM (1999) indicates that no active faults have been identified at the project site. Table 3-3 of that document indicated that the nearest earthquake of magnitude 5.0 or above was 65 miles from the site (in the Socorro area), with an effective peak horizontal ground acceleration at the mine area of 0.02g. An 1887 quake of magnitude 8.0 at a distance of 155 miles had an acceleration of 0.03g. Similar distant seismic activity can be expected in the future.

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action

3.7.2.1.1 Mine Development/Operation

The primary impact to geology from the Proposed Action would be caused by enlargement of the existing pit, removal of copper bearing ore and associated material, creation of new surficial materials in the form of waste rock piles and tailings, and overall site disturbance.

For the Proposed Action, 152 million tons of ore and other material would be extracted during the life of the mine. The total quantity of waste generated is estimated at 52 million tons. Land disturbance would be 1,586 acres, of which 745 acres would be on public land. The pit area would be approximately 169 acres with a bottom about 900 feet below land surface. The possibility exists that the steep side slopes of the pit would be subject to ongoing erosion or mass wasting, leading to accumulation of material in the pit bottom.

These impacts are judged to be significant because they would involve the removal of a large quantity of existing geologic materials and are thus major in the context of local conditions, are permanent, and are certain.

Based on the analysis in BLM (1999), there would be no loss of placer gold facilities, as most placer workings are already covered by the current tailings facility, and the remaining resources are not economically recoverable at current gold prices. Waste piles are not projected to cover any known mineral resources.

The BLM (1999) reported on the potential that a major earthquake could impact the site, with the primary concern being potential failure of the tailings dam. The following is quoted from that document (p. 4-1) and is based on an evaluation in SHB (1980).

> SHB "estimated that a magnitude 6.0 earthquake 15 miles from the site is the most conservative maximum credible earthquake predicted for the mine area. This would result in an estimated P-wave acceleration of 0.15 times the acceleration of gravity at the site of the TSF. The evaluation of SHB (1980) compared the proposed TSF dam at Copper Flat to similar Chilean tailings dams and hydraulic fill and sandy embankments that have experienced earthquakes. Their evaluation indicated that the proposed tailings dam should experience only cracks and that major liquefaction flow would not be expected under the maximum credible earthquake for the project site. Buildings and structures located at the mine area would be designed to meet the New Mexico State Engineer's Office seismic design criteria".

3.7.2.1.2 Mine Closure/Reclamation

No impacts to geology or mineral resources are anticipated as a result of mine decommissioning, removal of facilities, dewatering of the tailings facility, or reclamation of waste rock disposal areas.

3.7.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Impacts to geology from Alternative 1 would be identical in character to those that would result from the Proposed Action. The dimensions of the impact would vary slightly. For Alternative 1, 163 million tons would be extracted during the life of the mine. The total quantity of waste generated is estimated at 60 million tons. Land disturbance would be 1,402 acres of which 644 acres would be on public land. The pit area would be approximately 156 acres with a bottom about 900 feet below land surface. All other impacts described in Section 3.7.2.1 would also apply to Alternative 1.

3.7.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Impacts to geology from Alternative 2 would be identical in character to those that would result from the Proposed Action. The dimensions of the impact would vary somewhat. For Alternative 1, 158 million tons would be extracted during the life of the mine. The total quantity of waste generated is estimated at 33 million tons. Land disturbance would be 1,444 acres of which 630 acres would be on public land. The pit area would be approximately 161 acres with a bottom about 1,000 feet below land surface. All other impacts described in Section 3.7.2.1 would also apply to Alternative 2.

3.7.2.4 No Action Alternative

Under the No Action Alternative, there would be no impacts of mining on the pit or other site conditions. Impacts from ongoing abatement of contamination at the existing tailing piles are outside the scope of this draft EIS.

3.7.3 Mitigation Measures

While NMCC would apply BMPs to its operations, such practices would not be considered to mitigate the impacts to geology discussed above.

3.8 SOILS

3.8.1 Affected Environment

Soil is a collective term for the inorganic and organic substrate covering bedrock in which vegetation grows and a multitude of organisms reside. Soils are surveyed nationwide by county. Soil resources provide a foundation for both plant and animal communities by establishing a substrate for plant growth and vegetative cover for animal habitat and feeding. These resources are equally important in both terrestrial and aquatic environments.

Soil properties at any given site are determined by five factors: 1) physical and mineralogical composition of the parent material; 2) climate under which the soil material accumulated and has existed since accumulation; 3) plant and animal life atop and within the soil; 4) topography, or the "lay of the land"; and 5) length of time that these forces of soil formation have acted on the parent material.

3.8.1.1 Soil Associations

Based on a Natural Resource Conservation Service (NRCS) soil survey, four soil associations are present within the proposed mine area. (See Figure 3-25.) Descriptive and interpretive data for each soil association was derived from the *Soil Survey of Sierra County, New Mexico* (NRCS 1984). (See Table 3-24.) Vertical soil profiles for each soil association are detailed in NRCS (1984).

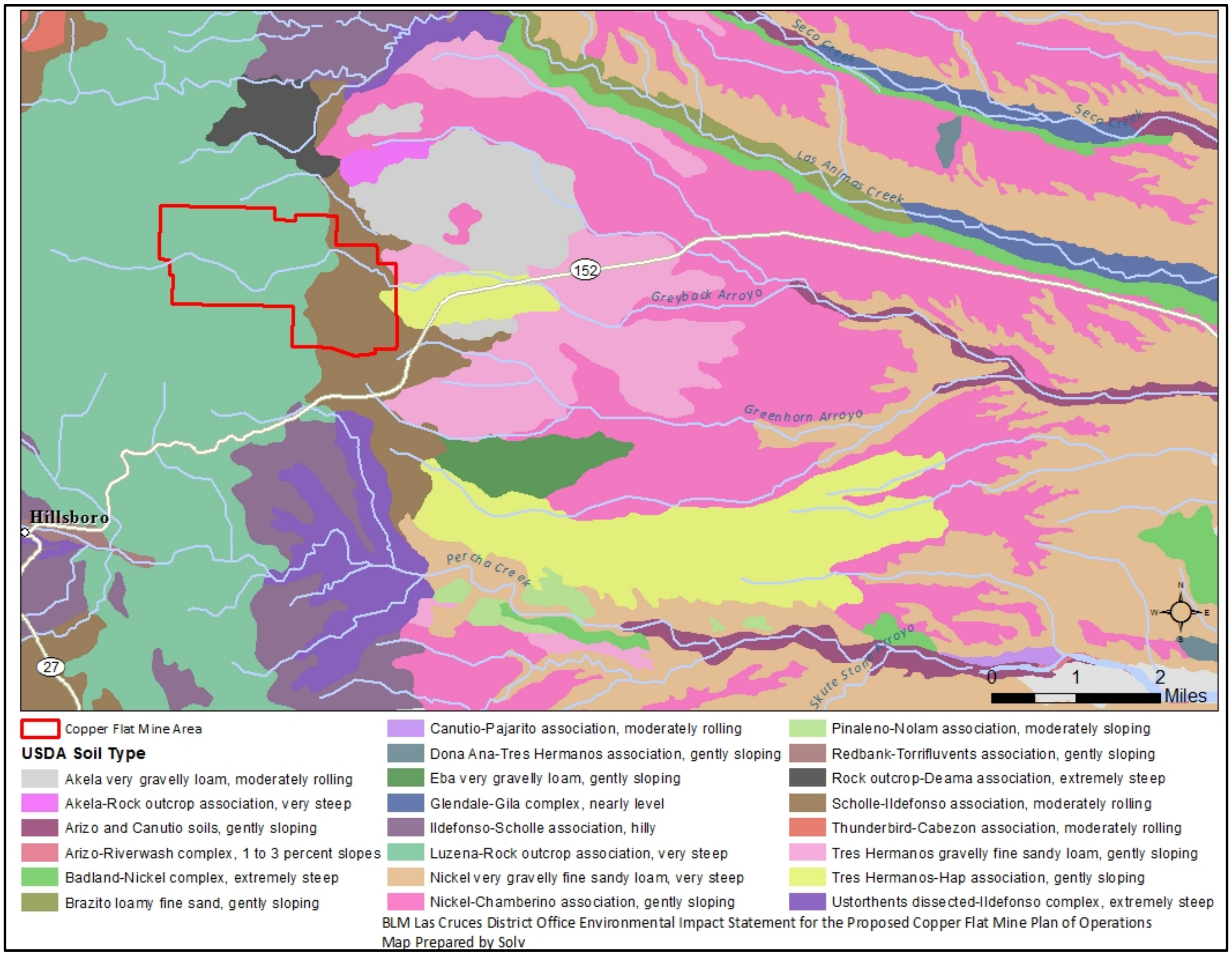
The largest portions of the proposed mine area are classified as the Luzena-Rock Outcrop association, very steep; and the Scholle-Ildefonso association, moderately rolling. The Tres Hermanos gravelly fine sandy loam, gently sloping; and the Tres Hermanos-Hap association, gently sloping, are also found on smaller portions of the site.

The Luzena-Rock Outcrop association is located on the western-most portion of the proposed mine area and encompasses the largest portion of the site. The Luzena-Rock Outcrop association occurs on hills and low mountains with slopes ranging from 5 to 55 percent. Luzena-Rock Outcrop association soils are generally shallow, approximately 14 inches deep, with very gravelly and cobbly loams and clay loams, and with 30 percent of the surface consisting of stone, cobbles, and gravel. The native vegetation that typically establishes on these soils consists predominantly of a variety of grasses and scattered shrubs and juniper.

Further east on the proposed mine area lies within the Scholle-Ildefonso association. This soil occurs on gentle slopes, piedmonts, and mountain toe slopes, with slopes ranging from 1 to 15 percent. This soil consists of a mixture of alluvium and various textures that include gravelly to very gravelly loams and clay loams. These soils are greater than 60 inches deep and are well-drained. The native vegetation that typically establishes on Scholle-Ildefonso association soils consists primarily of grass species.

A very small portion on the easternmost portion of the proposed mining area lies within the Tres Hermanos gravelly fine sandy loam, gently sloping, and Tres Hermanos-Hap association, gently sloping. Tres Hermanos soils are deep and well-drained. They typically have a light brown gravelly sandy loam or sandy clay loam surface layer about 8 cm (3 in) thick. The subsoil is reddish brown calcareous gravelly light clay loam about 60 cm (24 in) thick. The substratum to more than 150 cm (60 in) is a very gravelly loam high in lime. Tres Hermanos soils occur on fan terraces with slopes of 2 to 15 percent. These soils have moderate available water capacity, moderate permeability and moderate shrink-swell. They are moderately alkaline and calcareous throughout. Runoff is medium to rapid and the hazard of erosion is moderate.

Figure 3-25. Soils at the Proposed Copper Flat Mine Area



Source: USDA 2011.

Ten additional soil units occur outside the mine area that may be affected by project actions. Soils along Las Animas Creek are the Badland-Nickel complex, extremely steep; the Glendale-Gila complex, nearly level; and the Brazito loamy fine sand, gently sloping. Soils along Percha Creek are the Nickel very gravelly fine sandy loam, very steep; the Pinaleno-Nolam association, moderately sloping; the Badland-Nickel complex, extremely steep; the Arizo and Canutio soils, gently sloping; the Canutio-Pajarito association, moderately rolling, the Thunderbird-Cabezon association, moderately rolling, and the Akela very gravelly loam, moderately rolling. Soils in between the two creeks, including along NM-152 are the Tres Hermanos-Hap association, gently sloping; the Akela very gravelly loam, moderately rolling; the Tres Hermanos gravelly fine sandy loam, gently sloping; the Nickel-Chamberino association, gently sloping; the Nickel very gravelly fine sandy loam, very steep; and the Arizo and Canutio soils, gently sloping.

3.8.1.2 Soil Suitability for Reclamation

The following properties are considered unsuitable criteria when determining what soils are suitable growth medium for reclamation: greater than 60 percent clay, less than 0.5 percent organic matter content, greater than 35 percent coarse material by volume, salinity values greater than 15 milliohms per cm, greater than 15 percent sodium adsorption ratio, pH values less than 4.5 and greater than 9.0, calcium carbonate content greater than 40 percent, and slope steepness greater than 40 percent (USDA 1993).

Table 3-24. Summary of Soils in the Copper Flat Mine Area

Soil Survey Map ID	Soil Association	Soils	Depth to Calcium Carbonate in profile (in)	Depth to Bedrock (in)	Slope (%)	Available Water Capacity[1]	Surface Layer pH	Topsoil	Water Erosion Hazard[2]	Wind Erosion Hazard	Suitability for Reclamation[3]
4	Akela	Akela very gravelly loam	3	4-20	1-15	0.07-0.09	7.4-8.4	Poor	0.10	Very slight	Poor
13	Arizo and Canutio Soils	Arizo very gravelly sandy loam	0	>60	1-9	0.05-0.07	7.4-8.4	Poor	0.10	Moderate	Limited
		Canutio very gravelly sandy loam	0	>60	1-9	0.04-0.08	7.9-8.4	Poor	0.10	Moderate	Limited
16	Badland-Nickel Complex	Badland	N/A	>60	35-150	N/A	N/A	N/A	N/A	N/A	Not rated
		Nickel very gravelly fine sandy loam	0	>60	15-55	0.07-0.09	7.4-8.4	Poor	0.10	Moderate	Poor
23	Brazito	Brazito loamy fine sand	0	>60	0-5	0.06-0.10	7.4-8.4	Fair	0.20	High	Limited
26	Canutio-Pajarito Association	Canutio very gravelly sandy loam	0	>60	1-5	0.04-0.08	7.9-8.4	Poor	0.10	Moderate	Limited
		Pajarito gravelly sandy loam	0	>60	1-9	0.09-0.11	7.4-8.4	Fair	0.15	Moderate	Limited
37	Glendale-Gila Complex	Glendale silty clay loam	0	>60	0-3	0.16-0.21	7.9-8.4	Fair	0.37	Moderate	Limited
		Gila very fine sandy loam	0	>60	0-3	0.16-0.18	7.9-8.4	Poor	0.55	High	Limited
53	Luzena-Rock Outcrop Association	Luzena gravelly loam	9	7-20	5-55	0.11-0.12	6.1-7.3	Poor	0.20	Very Slight	Poor
		Rock outcrop	N/A	N/A	5-55	N/A	N/A	N/A	N/A	N/A	Not rated

Table 3-24. Summary of Soils in the Copper Flat Mine Area (Concluded)											
Soil Survey Map ID	Soil Association	Soils	Depth to Calcium Carbonate in profile (in)	Depth to Bedrock (in)	Slope (%)	Available Water Capacity1	Surface Layer pH	Topsoil	Water Erosion Hazard2	Wind Erosion Hazard	Suitability for Reclamation3
62	Nickel	Nickel very gravelly fine sandy loam	0	>60	10-65	0.07-0.09	7.9-8.4	Poor	0.10	Moderate	Limited
63	Nickel-Chamberino Association	Nickel very gravelly fine sandy loam	0	>60	1-7	0.07-0.09	7.9-8.4	Poor	0.10	Moderate	Limited
		Chamberino gravelly loam	1	>60	1-5	0.06-0.10	7.9-8.4	Poor	0.20	Slight	Limited
67	Pinaleno-Nolam Association	Pinaleno very gravelly sandy loam	28	>60	3-15	0.04-0.07	6.1-7.8	Poor	0.10	Moderate	Limited
		Nolam very gravelly loam	8	>60	1-7	0.04-0.06	7.9-8.4	Poor	0.10	Very Slight	Limited
76	Scholle-Ildefonso Association	Ildefonso gravelly loam	0	>60	1-15	0.06-0.08	7.4-8.4	Poor	0.20	Slight	Limited
		Scholle very gravelly loam	10	>60	1-15	0.09-0.12	7.4-7.8	Poor	0.10	Very Slight	Limited
79	Thunderbird-Cabezon Association	Thunderbird loam	N/A	20-40	1-10	0.16-0.18	6.6-7.8	Poor	0.37	Slight	Limited
		Cabezon gravelly clay loam	N/A	4-20	1-15	0.13-0.15	6.1-7.3	Poor	0.15	Very Slight	Limited
81	Tres Hermanos	Tres Hermanos gravelly fine sandy loam	0	>60	1-9	0.11-0.13	7.4-8.4	Poor	0.15	Moderate	Limited
82	Tres Hermanos-Hap Association	Tres Hermanos gravelly loam	0	>60	1-10	0.11-0.13	7.4-8.4	Poor	0.20	Slight	Limited
		Hap very gravelly loam	20	>60	1-7	0.10-0.14	6.6-7.3	Poor	0.10	Very Slight	Limited

Source: NRCS 1984.

Notes: [1]Inches of water per inch of soil.

[2]Values range from 0.02 to 0.69; the higher the value, the more susceptible to water erosion.

[3]Based on the requirements for rangeland seeding.

Soils in the southwest are dominated by calcium carbonate, too much of which can cause problems for plant establishment. The amount or percent of it that prohibits seed germination can vary and depends on plant type. However, seed mixes that are used for reclamation include a variety of species, including some that could germinate under conditions with calcium carbonate. Caliche is a hardened natural cement of calcium carbonate that binds other materials and generally forms when minerals leach from the upper layer of the soil and accumulate in the lower layers, although it can also be found on the surface.

A successful reclamation program is dependent, in part, upon the quantity and quality of material available for use during the reclamation process. To this end, soil surveys of the Copper Flat baseline study area were conducted to assess the quantity and quality of available topdressing material that would be available for mine reclamation (THEMAC 2011). Three suitability categories were identified based on such factors as slope, texture, sand/silt/clay content, water holding capacity, percent cobbles/boulders, calcium carbonate accumulations, pH, and salinity: good, fair, and unsuitable. Each pedon (defined as the smallest volume of soil that contains all the soil horizons of a particular soil type) included in the NMCC (2012) report received a good or fair rating. The suitability criteria standards for these soil and landscape features have been adapted from those used by the NRCS and MMD. They were modified by project soil scientists to reflect the conditions that exist within the Copper Flat area. Tailings substrata were considered unsuitable as topdressing because of their processed origins, though none of the available element levels were present in amounts likely to be toxic to plants or to bioaccumulate in animals as they were within or below the normal ranges of these elements commonly found in soil (THEMAC 2011).

3.8.2 Environmental Effects

Soils can be altered through three processes: 1) physical degradation, such as wind and water erosion, and compaction; 2) chemical degradation such as toxification, salinization, and acidification; and 3) biological degradation, which includes declines in organic matter, carbon, and the activity and diversity of soil fauna. While there are few applicable regulations regarding soils, proper conservation principles can reduce erosion, decrease turbidity, and generally improve water quality.

3.8.2.1 Proposed Action

Long-term moderate adverse effects to soils would be expected under the Proposed Action. Impacts would be of medium extent and the likelihood of impacts is probable. Anticipated impacts to soil resources include the potential loss of productive topdressing in disturbed areas, increased wind and water erosion, loss of native soil profiles, and potential for contamination of soils from spills of chemicals during transportation, storage, and use. After closure of the mine and completion of reclamation procedures, soils would be stabilized and largely restored to their pre-mine condition. Impacts of the Proposed Action on soils would be significant.

3.8.2.1.1 Mine Development and Operation

Mine development activities that would remove, compact, and otherwise destroy or disturb soils include drawdown of groundwater, expansion of the existing open pit, and construction of:

- Haul and secondary mine roads;
- WRDFs;
- Low-grade ore stockpiles;
- The mill and associated processing facilities;
- The TSF;
- Ancillary buildings;
- A suitable water supply network;
- Growth media stockpiles; and

- Surface water diversions.

There would be no impacts to soils from the production wells, which already exist. All roads, power lines, and foundations for the production wells are in place. No additional disturbance would occur during the project, and the well area would be left as it currently exists after closure of the mine. Approximately 1,586 acres of soils on both public and private lands would be directly affected. While 910 acres of the proposed mine area have previously been disturbed from past mining activities, the proposed mining activities would impact 676 acres of undisturbed land within this boundary.

The Proposed Action would result in long-term moderate adverse impacts on soils from clearing, grubbing, grading, construction of mine facilities, and mine operation. Mining operations would modify the surrounding landscape by exposing previously undisturbed earthen materials. Erosion of exposed soils, extracted mineral ores, tailings, and fine material in waste rock piles can result in substantial sediment loading to surface waters and drainage ways. In addition, spills and leaks of hazardous materials and the deposition of contaminated windblown dust can lead to soil contamination and toxicity. These impacts would be controlled to an acceptable level through the diligent application of BMPs, which would utilize various measures and structures such as straw bales and silt fencing to minimize the transport and loss of soil from erosion and storm runoff. Sedimentation control structures would be installed prior to construction and a SWPPP in compliance with USEPA and State of New Mexico requirements would be implemented.

During construction and preparation activities, growth media would be removed and stockpiled wherever possible and reused in the area where it was salvaged. The soils to be removed above the rock layer would be stockpiled and protected for use in reclamation of the site. Caliche, which acts as a moisture holder in desert soil, drying out the soil above, causes problems for plant establishment. Too much caliche, generally greater than 10-20 percent, is not appropriate for surface layers of a soil cover (Vinson 2014). Soils with too much surface caliche result in low plant productivity and diversity; however, where the caliche occurs 5 inches or below ground surface, plant growth is not a problem. Thus, a suggested BMP is to stockpile soils with more than 10-20 percent caliche separately from those with less caliche. Then during reclamation, soils with more caliche would be laid down first, and soils that have less caliche laid on the surface.

Measures to stabilize and protect growth medium stockpiles and embankments would be implemented to minimize soil loss and limit disturbance to soils on-site. Any growth media remaining in a stockpile for one or more planting seasons would be seeded with an interim seed mix to stabilize the material by reducing erosion and minimizing establishment of undesirable weeds. Additionally, the establishment of a temporary vegetative cover may aid in reestablishing biological activity in the soil.

Exposure and disturbance of soils could increase the potential for accelerated soil erosion from sites affected by construction. Construction and mining activities would impede soil development, including soil structure and profile development. Excavation, transportation, and placement of growth medium also could promote the breakdown of soil aggregates into loose soil particles, increasing the potential for wind and water erosion of stockpiled soils. Blading or excavation of remaining subsoil materials to achieve desired grades and soil conditions for the facilities could result in steeper slopes on exposed soils, mixing of soil materials, and the additional breakdown of subsoil aggregates. Soil biological activity (especially with mycorrhizea-root association) and nutrient cycling would be substantially reduced or eliminated during stockpiling as a result of anaerobic conditions created in deeper portions of the stockpiles.

Although stripping, stockpiling, and redistribution adversely affect soil characteristics, including alterations of soil profiles and soil structures, the benefits of using soil for revegetation outweigh the adverse effects of soil handling. Reclamation and revegetation efforts would return some areas of soil disturbance to a productive state following construction, thereby reducing the duration and magnitude of impact. Loss of soil or discontinuation of natural soil development, decreased infiltration and percolation rates, decreased available water-holding capacities, breakdown of soil structures, and loss of organic material as a result of the Proposed Action would be lessened by natural soil development over the long-term.

Mining dust changes the texture of soils as well as adding contaminants like metals. Acid mine drainage is a potentially severe pollution hazard that can contaminate surrounding soil, groundwater, and surface water. Runoff from mines into surrounding environments alters the pH of the receiving soils, contaminates soils with trace elements, and ultimately deteriorates soil fertility. Studies have shown that trace metals remain in the soil for a long time, ranging from hundreds to thousands of years. Direct impacts to soil from the release of mill reagents or leach solutions during operation of the facility would be minimized with the continued use of the spill prevention and dust control measures that are currently in place. If pit water is used for dust suppression, high TDS, sulfates, metals, etc. contained in the water would contaminate soils. Such impacts could range from negligible to moderate depending on contaminant concentrations.

Potential indirect effects of soil destabilization and erosion would be dust generation and off-site deposition. Wind erosion of disturbed soils could result in deposition of soil particles off-site. Off-site stream sedimentation would be minimized by the use of erosion control practices such as sediment catchment basins placed around the base of soil stockpile and dump slopes. Dust generated by vehicular traffic would be reduced by using dust abatement techniques such as the application of wetting and binding agents on haul roads. Erosion from growth medium stockpiles would be kept at a minimum with the practice of interim seeding.

Mining operations would involve the drawdown of groundwater. However, none of the hydric soils at the mine site or elsewhere in the action area would be affected by that drawdown. Hydric soils in the wetlands along the site’s arroyos, streams, and creeks do not rely on groundwater but have an alternative source of water, such as flooding or a perched water table. Neither of the two wetlands at the mine site would experience hydric soils changes. Hydric soils of the small cattail wetland adjacent to the pit lake would be removed since pumping of the pit lake would be necessary prior to mining and continuously throughout the life of the mine with bedrock water drawdown in this area greater than 100 feet. (See Figure 3-13.) This small wetland would be mined out when the pit is deepened to 900' below the current surface, so no surface soils would remain. The second wetland area near the main mine entrance, would not be affected by drawdown associated with the Proposed Action because it would be outside of the drawdown area. (See Figure 3-13.) This area overlies the andesite bedrock of the Animas Uplift. As a result, there is no aquifer underlying the surface.

There would be no effects to any hydric soils at Percha Creek near Hillsboro as no water drawdown is expected where they occur. The downstream end of Percha Creek, where drawdown of groundwater in the shallow alluvium could be 0.5 to 1.5 feet by the end of mining, is dominated by upland soils and vegetation. Groundwater drawdown that could affect the shallow alluvium of Percha Creek would not occur in any area of the creek that supports riparian vegetation or hydric soils.

Perched alluvial groundwater under Las Animas Creek has limited hydraulic connection to the main aquifer that would be directly impacted by pumping of the supply wells. Hydrology within the perched layer reflects localized conditions such as seepage from irrigation canals and irrigated fields, and pumping of small capacity private wells. The groundwater model predicts drawdown in the shallow alluvium along Las Animas Creek to be less than 1 inch (see Section 3.11, Vegetation and Non-native Invasive Species and Table 3-29 for an explanation of calculations) after mining ceases. Because the groundwater drawdown of the shallow alluvium (12 AFY) would be so small relative to depletion of groundwater and the existing flow plus ET of the vegetation (4,848 AFY) there would be no change to the riparian plant community or any hydric soils adjacent to Las Animas Creek.

3.8.2.1.2 Mine Closure/Reclamation

Although the original physical structure of the landscape post-mining may be irreplaceable, the Copper Flat project site would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment, and land uses of the area. The New Mexico Mining Act requires the preparation of a reclamation plan for submittal and approval. The objective of the reclamation plan is to return the project site to conditions similar to those present before reestablishment of the mine. The reclamation plan is summarized in Chapter 2 of this document.

Contemporaneous reclamation of disturbed surface areas would be an integral part of the mining operation. Because concurrent reclamation reduces erosion, provides early impact mitigation, limits costs, and reduces final reclamation work, NMCC would maximize this type of reclamation at the Copper Flat project. Additionally, upon closure of the mining operations, previously unreclaimed facilities would be reclaimed.

As part of reclamation operations, disturbed areas would be stabilized by grading with earth-moving equipment to conform to the geomorphic character of the region and the surrounding area, including shaping, berming, and grading to final contour. Slope reclamation would incorporate the practice of minimizing slope lengths and gradients, while conforming to the geomorphic character of the surrounding areas to minimize the potential for excessive erosion. Both runoff and “run-on” (surface water running onto an exposed site) would be diverted from reclaimed areas to prevent erosion. Re-establishing vegetation would serve to stabilize underlying soils.

With sufficient growth medium material available, up to 36 inches would be placed during reclamation. Soils to be salvaged for reclamation cover that are deficient in nitrogen, phosphorus, and potassium and would require over 25,000 pounds per acre of amendments to create fertile growth media.

After soil redistribution, biological activity in soils would slowly increase, eventually reaching pre-salvage levels. Placement of soil over waste rock would change the character and texture of the original soil profiles. Although new soil profiles would develop over time, the original character of the native soil would be permanently changed.

Reclamation vegetation rooting depth and the soil’s available water-holding capacity may be limited in the growth medium. Ripping or otherwise loosening compacted surfaces prior to placement of growth medium and revegetation would aid in reclamation by reducing the interface between the compacted surface and growth medium, increasing the rooting depth and water-holding capacity of the growth medium at the reclaimed site. Loss of soil fertility, soil microorganisms, and vegetative productivity would be minimized after successful reclamation. Reclaimed areas would be susceptible to erosion until the site stabilizes over time.

The Proposed Action would use the upstream construction method for the tailings dam embankment. There are a number of common failure modes to which embankments may be vulnerable. These include slope failure from rotational slide, overtopping, foundation failure, erosion, piping, and liquefaction. Each failure mode may result in partial or complete embankment failure (USEPA 1994). Routine monitoring and preventive maintenance are crucial in order to assure proper performance of TSFs. The New Mexico OSE would approve the safety aspects of the dam.

3.8.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Implementation of Alternative 1 would result in the disturbance or loss of up to 1,401 acres of soils over the life of the mine. Direct effects on soil resources would be similar to those described under the Proposed Action and include the potential loss of productive topdressing in disturbed areas, increased wind and water erosion, loss of native soil profiles, and potential for contamination of soils from spills of chemicals during transportation, storage, and use. Within these areas, soils would likely be destroyed or disturbed and would require diligent implementation of the BMPs, SWPPP, and mitigation measures to contain and minimize this impact.

Mine closure and reclamation effects would also be similar to those described under the Proposed Action. Alternative 1 would use the centerline construction method for the tailings dam embankment. Potential effects include the chance for failure of the embankment due to seepage from the TSF. The OSE would approve the safety aspects of the dam.

Overall impacts of Alternative 1 to soils at the mine area would be direct, long-term, localized, moderate, probable, and significant. There would also be indirect impacts from groundwater pumping and pollutant migration via wind and water that would affected a larger area beyond the mine area.

3.8.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Implementation of Alternative 2 would result in the disturbance or loss of up to 1,444 acres of soils over the life of the mine. Direct effects on soil resources would be similar to those described under the Proposed Action and include the potential loss of productive topdressing in disturbed areas, increased wind and water erosion, loss of native soil profiles, and potential for contamination of soils from spills of chemicals during transportation, storage, and use. Within these areas, soils would likely be destroyed or disturbed and would require diligent implementation of the BMPs, SWPPP, and mitigation measures to contain and minimize this impact.

Mine closure and reclamation effects would also be similar to those described under the Proposed Action. Alternative 1 would use a centerline construction method for the tailings dam embankment. Potential effects include the chance for failure of the embankment due to seepage from the TSF. The OSE would approve the safety aspects of the dam.

Overall impacts of Alternative 2 to soils at the mine area would be direct, long-term, localized, moderate, probable, and significant. There would also be indirect impacts from groundwater pumping and pollutant migration via wind and water that would affected a larger area beyond the mine area.

3.8.2.4 No Action Alternative

Under the No Action Alternative, there would be no disturbance of soils from clearing, grubbing, grading, and other project-related activities at the mine area. No soils would be disturbed or removed. The No Action Alternative would not have any new impacts on soils. The same current conditions and impacts would still occur (i.e., pollutant migration through wind and water). Groundwater pumping would not occur. Therefore, there would not be any mining produced impacts to riparian soils and vegetation. Current pit water would not be used for dust suppression and pollutants within pit water would not be introduced on the soil surface. Additional acreage of soil disturbance would not occur and would remain in its current condition.

3.8.3 Mitigation Measures

BMPs would be used to limit erosion and reduce sediment in precipitation runoff from proposed project facilities and disturbed areas during construction, operations, and initial stages of reclamation. BMPs that would be used during construction and operation to minimize erosion and control sediment runoff would include:

- Surface stabilization measures – dust control, mulching, riprap, temporary and permanent revegetation/reclamation, and placing growth media;
- Runoff control and conveyance measures – hardened channels, runoff diversions; and
- Sediment traps and barriers – check dams, grade stabilization structures, sediment detention, sediment/silt fence and straw bale barriers, and sediment traps.

Revegetation of disturbed areas would reduce the potential for wind and water erosion. Following construction activities, areas such as cut and fill embankments and growth media/cover stockpiles would be seeded as soon as it is practicable and safe. Contemporaneous reclamation would be maximized to the extent practicable to accelerate revegetation of disturbed areas. All sediment and erosion control measures would be inspected periodically and repairs performed as needed.

3.9 HAZARDOUS MATERIALS AND SOLID WASTE/SOLID WASTE DISPOSAL

3.9.1 Affected Environment

3.9.1.1 Project Site

Previous mining operations utilized hazardous materials and generated nonhazardous and hazardous wastes. After mining operations ceased in 1982, the plant remained on a "care and maintenance" status until 1986, when the facilities were sold and dismantled and the site was reclaimed (BLM 1999). All on-site surface facilities were removed; however, some of the former infrastructure, including building foundations, power lines, and water pipelines, were left in place.

NMCC has no record, nor is there any evidence, of a landfill on site. There is no evidence of previous hazardous material spills and there are no stored chemicals remaining on site. Neither hazardous nor nonhazardous waste is currently generated or disposed of at the site. The private land is not open to the public due to efforts to prevent or limit public access for safety and security reasons. Gates and fences have been installed within patented land boundaries. Existing diversion ditches and berms prevent stormwater from outside of the plant and mine areas from coming into contact with the disturbed areas of the mine area by routing stormwater from the west around the mine area and back to the natural surface water course at a location just west of the tailings facility.

Federal, State, and local regulations are established for the management and reporting requirements for hazardous materials and solid waste that would be applicable to the proposed project. The statutes to be followed would include, but would not be limited to:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (40 CFR 300);
- Oil pollution prevention (40 CFR 112);
- Resource Conservation and Recovery Act (RCRA) (disposal of solid and hazardous waste) (40 CFR 258 - 40 CFR 272);
- Hazardous Materials Regulations 49 CFR Subtitle B (hazardous materials and oil transportation);
- Section 112 of the Clean Air Act (hazardous air pollutants);
- Section 303 of the Clean Water Act (water quality implementation plans);
- Section 402 of the Clean Water Act (National Pollutant Discharge Elimination System);
- Section § 74-6-4.B of the New Mexico Water Quality Act;
- Chapter 74, Article 4 NMSA 1978 of the New Mexico Hazardous Waste Act;
- 20.7.3 NMAC (liquid waste disposal and treatment regulations);
- 20.5 NMAC (aboveground and underground storage tank regulations);
- 20.4.1 NMAC (hazardous waste management);
- 20.9 NMAC (solid waste management rules); and
- 92.011 Sierra County Ordinance (waste disposal requirements).

3.9.1.2 Transportation Access

Access from the site is by 3 miles of all-weather gravel road and 10 miles of paved highway (NM-152) east to I-25, near Caballo Reservoir. The 10 miles on NM-152 to I-25 is a two-lane highway that is mostly straight and relatively flat and does not include any sharp turns or significantly adverse grades. I-25 is the primary north-south interstate highway. There are no perennial water crossings between the mine area and I-25 on NM-152. I-25 crosses the Rio Grande south of Caballo Reservoir.

3.9.2 Environmental Effects

3.9.2.1 Proposed Action

Short-term minor adverse effects would be expected under the Proposed Action. The use and management of hazardous materials required for operation of the Copper Flat project are discussed in Chapter 2. The short-term minor adverse effects would be limited to an accidental release during standard facility operations and for mine closure and reclamation. No long-term adverse effects would be anticipated due to the required response actions that would be taken in the event of an accidental release. Overall, these effects would not be significant.

3.9.2.1.1 Mining Development and Operation

Mine development and operations activities would utilize both hazardous and nonhazardous materials and would generate nonhazardous and small amounts of hazardous waste. Because of safety measures that would be in place for the life of the project, accidental hazardous materials releases would be unlikely. The potential effect of an accidental release during development and operations would range from not significant to significant depending on the type of material, size, and location of a release.

3.9.2.1.1.1 Material Types

Hazardous Materials: The following materials would be utilized during mine operations:

- Fuels – diesel fuel, gasoline, oils, greases, anti-freeze, and solvents used for equipment operation and maintenance;
- Propane;
- Degreasing solvents;
- Plant reagents – sodium hydrosulphide, sodium hydroxide, acids, flocculants, and anti-scalants used in processing plant applications;
- Blasting agents – ammonium nitrate, fuel oil, ammonium nitrate/fuel oil (ANFO), emulsions, blasting caps, initiators and fuses, and other high explosives used in blasting; and
- Others – assay chemicals, and other hazardous waste classified as by-products.

Specific hazardous materials and quantities to be used during operations would be determined prior to the beginning of mining operations. Issues relating to the presence of hazardous materials may include the accidental releases of these materials during transportation, storage, handling, and use at the Copper Flat project and their potential impacts on the environment. The environmental resources that could be potentially affected by these hazardous materials if they are accidentally released include air, water, soil, and ecological resources. Such a release could also impact human health and safety and is discussed in Section 3.24, Human Health and Public Safety.

Nonhazardous Solid Waste: Nonhazardous solid wastes that would be generated at the site include waste paper, wood, scrap metal, used tires, and other domestic trash. Liquid waste would include sanitary waste and separated water from mobile equipment washing. Effects of the generation of solid waste would be associated with disposal sites available in the area and the capacity of landfill sites to hold solid waste from mining operations.

3.9.2.1.1.2 Materials Management

Hazardous and nonhazardous materials management is described in Section 2.7. The following section highlights on-site materials management that would be undertaken to minimize the potential occurrence for impacts to the environment.

Hazardous Materials and Waste: The Copper Flat facility would be a small quantity generator of hazardous waste as defined in 40 CFR 260.10. Small quantity generators generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month. The generation of small quantities of hazardous waste at the facility would occur through the life of the project. Management of hazardous materials at the Copper Flat mine area would comply with all applicable Federal, State, and local requirements. Requirements include the inventorying and reporting requirements of Title III of CERCLA, also known as the Emergency Planning and Community Right to Know Act, and in accordance with regulations identified in 40 CFR 262 Standards Applicable to Generators of Hazardous Waste and 20.4.1 NMAC, Hazardous Waste Management.

All petroleum products and reagents used would be stored in aboveground storage tanks (ASTs) within secondary containment as required by Federal, State, and local requirements and regulations. ASTs would be registered with the NMED Petroleum Storage Tank Bureau and an AST operations and maintenance plan would be developed per NMAC 20.5.5.9 for AST systems. The anticipated volume of diesel stored at the site would be less than 500,000 gallons, to be contained in two 248,690-gallon ASTs constructed per 20.5.4 NMAC. The tanks would be installed on lined pads, which would consist of gravel underlain by a plastic liner. The pad area would be surrounded by berms to provide secondary containment for the largest vessel in case of rupture. Surface piping leads from each tank to the fuel dispensing area. The refueling hoses would be equipped with overflow prevention devices and secondary containment. Fuel oil would be kept in a 7,106-gallon-capacity tank (10 feet tall with an 11-foot diameter), and would also be surrounded by secondary containment constructed of a geo-synthetic membrane with a minimum thickness of 60 mils, plus 10 percent to account for potential stormwater that may be present. The secondary containment system would be in compliance with the current edition of an industry standard or code of practice developed by NMED as detailed per 20.5.4 NMAC.

Antiscalants, or chemicals used in the mineral separation frothing process, would be used during mining operations. Less than 2,000 gallons of antiscalants would be stored in appropriate ASTs that meet industry standards.

Blasting components including ammonium nitrate and diesel fuel would be stored on-site in bins and tanks per regulatory standards. NMCC anticipates utilizing two explosives magazines (one for boosters and one for blasting caps), each no larger than 8 feet by 8 feet with 1,000-pound capacities. In addition, NMCC would utilize one 75-ton-capacity, 3,000-square-foot silo for storage of ammonium nitrate. All explosive materials would be stored away from the plant site in compliance with the Mine Safety and Health Administration, New Mexico State Mine Inspector's regulations, the NMAC 20.4.2 Hazardous Waste Permit and Corrective Action Fees, and U.S. Department of Homeland Security requirements. Proper inventory records of daily transactions would be maintained and regular inspections would be conducted.

Reagents would be maintained in the reagent building, a structure made with concrete block walls and a metal roof, slab on grade construction, and a 6-inch-thick concrete floor. On-site reagent storage would include the following:

- Lime storage: A 200-ton-capacity silo (24 feet tall and 20 feet in diameter) would funnel lime into a lime feed pump tank and from there into two holding tanks.
- Xanthate (K.Amyl) (or equivalent): Flotation reagent Xanthate would be kept in drums and transferred to a mixing tank, then to a holding tank, and finally to the head tank.
- AEROFLOAT 238 (or equivalent): Aerofloat is used as a flotation promoter. It would be received in 50-gallon drums with a storage capacity of 2,800 gallons. It would be kept in drums and transferred to a mixing tank, then to a holding tank, and finally to a head tank.
- MIBC (or equivalent): MIBC would be transferred from trucks to a holding tank and, as needed, to a head tank.
- AERODRI 100: Used as a filter and dewatering aid, would arrive on-site in 500-pound drums. The reagent would be fed directly from the drums into the milling process. Use of small amounts (less than 100 pounds) of sulfuric acid would be limited to the laboratory.

Empty reagent drums would not be disposed of on-site but would be recycled by the reagent supplier. Per 40 CFR 273, empty drums would not be stored to await pick up for a period of longer than 1 year.
A nuclear density gauge would be used to measure slurry density during processing. NMCC would not provide or use the gauge. The gauge would be used on-site by an appropriately licensed contractor per the safety and regulatory requirements of the Nuclear Regulatory Commission and other Federal and State requirements.

Nonhazardous Solid Waste/Waste Disposal: Nonhazardous waste generated during mining operations would be recycled or placed in a permitted State and county-approved on-site Class III solid waste landfill on private land that would operate for the life of the mine. Materials that are recyclable, such as scrap metal, would be sold and transported off-site. Sanitary liquid waste would be handled and disposed of through two existing septic tanks and a leach field system permitted by NMED. The washing facility for the mobile equipment would be equipped with a water/oil separator system. As part of periodic maintenance, waste oil, lubricants, and sediments would be collected and transported off-site by a buyer/contractor for recycling.

3.9.2.1.1.3 Releases

A spill, release, or discharge of a hazardous or other material or emissions during handling, use, or storage has the potential to cause pollution or other harm to the environment or to the public. As described in Chapter 2, measures would be taken for proper management and storage of hazardous materials. Section 3.24, Human Health and Public Safety, also describes the requirements of personnel to handle all hazardous materials. Stormwater would continue to be diverted around mining operations; therefore the potential for a release to impact surface waters on-site are low.

On-site Spills: Over the life of the proposed project, small or limited spills of oils and lubricants would have the possible likelihood of occurring. These releases could occur during operations, for example, as a result of a bad connection on an oil supply line, from equipment failure, or from mishandling during transfer operations. Impacts of such minor spills could include contamination of surface soils. Spills of this nature would most likely be small, localized, and contained. Potential reagent spills would be contained by curbs in the reagent mixing and storage areas. A floor sump pump would be used to return the spilled material either to the storage tank or into the milling process as necessary. Formal safety data sheets for the reagents would be posted and readily available, in accordance with MSHA's Hazard Communication for the Mining Industry (30 CFR Part 47).

The potential for spills of both hazardous and non-hazardous materials would be further mitigated with the implementation of a SPCC plan. The SPCC plan describes the reporting requirements and response actions that would take place in the event of a spill, release, or other upset condition, as well as procedures for cleanup and disposal. The plan would be posted and distributed to key site personnel and would be used as a guide in the training of employees. The plan would also address mitigation of potential spills associated with project facilities as well as activities of on-site contractors. The SPCC plan would be reviewed and updated at a minimum of every 3 years, and whenever major changes are made in the management of the materials addressed in the plan. Inspection and maintenance schedules and procedures for tanks at the site, as well as all piping connecting the facility with the tailings pond, would be set forth in sections of the SPCC plan addressing hazardous materials and petroleum products. In addition, the implementation of a health and safety manual and hazard communication program would provide employees with education and awareness of hazardous materials management; thereby further minimizing the potential for spills at the mine area.

Transportation Spills: A spill, release, or discharge of any hazardous or other material during transportation, if not recovered in a timely manner, has the potential to cause pollution of waters of the State or cause other harm to the environment or to the public. There is the potential for a release to occur during transport of hazardous material however the potential is unlikely, as described below.

Traffic associated with the proposed Copper Flat project is estimated as follows:

- Concentrate shipments: An estimated ten trips per day would be made for the shipment of concentrate by trucks to smelters and port facilities. The miles per trip are estimated to be 41 miles per trip to the railhead at Rincon, New Mexico.
- Incoming supplies: Vendor, equipment, and service suppliers are anticipated to take in, total, an average of 10 to 15 trips per day by truck to the mine for delivery of gasoline, diesel fuel, explosives, solvents, and other hazardous materials, as well as other miscellaneous supplies, such as office supplies (NMCC 2012c). The miles per trip will vary depending on the location of the vendor but is assumed to be from El Paso, 125 miles from the site.
- Outgoing waste shipments: The mine is expected to generate only small quantities of hazardous wastes. These would be stored on-site until a sufficient quantity has been accumulated to warrant pickup by a licensed hauler. It is assumed that one pickup per month would be required.
- Solid waste: As described in Chapter 2, nonhazardous solid waste would be disposed of in an on-site landfill. The landfill would be permitted by the NMED Solid Waste Bureau. Sanitary liquid wastes would be handled and disposed of through two existing septic tanks/leach fields permitted by NMED.

The impact of an accidental release would depend on the location of the release in relation to populations and local activities, the quantity released, and the nature of the released material. The possibility of accidental release during delivery depends on factors such as skill and state of mind of the driver, type and condition of vehicle used for delivery, and traffic conditions and road type. Most of these factors are qualitative and even incidental. This evaluation considers only quantitative factors. The possibility of an accident resulting in the release of a process material, product, or hazardous material was determined by using a national statistical estimated release rate that was based on miles traveled, traffic volumes, and type of roadway (Abkowitz et al. 1984). The rate used is a composite of those factors and is an estimate of 0.28 releases per million vehicle miles traveled. Mileage is estimated to Rincon, New Mexico or to Las Cruces, New Mexico.

The potential for releases are as follows:

- Concentrate: 10 trips/day x 365 days/year x 41 miles/trip = 149,650 miles/year x 16 years for operation = 2,544,050 total miles x 0.00000028 = 0.67 releases in 16 years.
- Incoming supplies: 15 trips/day x 365 days/year x 125 miles/trip = 684,375 miles/year x 16 years for operation = 11,634,375 total miles x 0.00000028 = 3.07 releases in 16 years.
- Outgoing waste shipment: 1 trip/month x 12 month/year x 125 miles/trip = 1,500 miles/year x 16 years = 25,500 total miles x 0.00000028 = 0.007 releases in 16 years.

An accidental release could range from a minor oil spill on the project site where cleanup equipment would be readily available, to a large spill during transport possibly involving a release of diesel fuel or other hazardous substance (e.g., concentrate). Some of the chemicals could have immediate adverse effects on water quality and aquatic resources if a spill were to enter a surface water body. However, considering the anticipated transport routes and the small number of river or wetland crossings along the routes, the probability of a spill into a waterway is low. A large-scale release of hazardous liquids delivered to the site by tanker truck (7,500-gallon-capacity), such as diesel fuel, acid, or other hazardous substances, could have implications for public health and safety. The location of the release would again be the primary factor in determining its significance. As indicated, the probability of a release anywhere along a proposed transportation route was calculated to be low, and the probability of a release within a populated area would be lower yet.

In addition to location, the potential hazard presented by the material released is a factor in determining the significance of a release. The qualitative evaluation of the substances to be shipped indicates that the probability of causing significant harm is low for most substances. For example, though some of the material such as ANFO is an explosive, it will only detonate under specific conditions, such as when ignited with detonators, heat, or sudden shock wave in a confined space. Spill situations would be responded to per CFR Title 49 as necessary to prevent or minimize any exposure from occurring, such as by restricting site access and conducting immediate containment and removal. In the event of a release during transport, the commercial transportation company would be responsible for first response and cleanup. Local and regional law enforcement and fire protection agencies also may be involved initially to secure the site and protect public safety. In the event of an accident involving the release of hazardous material, CFR Title 49§171.15 and §171.16 require that the carrier notify local emergency response personnel and the U.S. Department of Transportation (DOT) National Response Center. Compliance with these and other regulatory requirements would be met by NMCC and their contracted carriers.

As described in Chapter 2, all hazardous materials and waste would be transported by commercial carriers contracted by the NMCC in accordance with the hazardous substances shipping requirements of CFR Title 49 and in compliance with the Federal Motor Carrier Safety Regulations of the DOT, parts 383, 390, 397, and 399. In the event of a release, the transportation company would be responsible for response and cleanup. The NMCC will specify that the contract carriers be licensed and inspected as required by the New Mexico Department of Public Safety/Motor Transportation Division and the DOT. The permits, licenses, and certificates are the responsibility of the carrier. CFR Title 49 requires that all shipments of hazardous substances be properly identified and placarded. Shipping documents must be accessible and include safety data sheets that contain information describing the hazardous substance, immediate health hazards, fire and explosion risks, immediate precautions, firefighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers. Hazardous wastes would also be transported from the project site to be properly disposed of in accordance with RCRA regulations. Transportation of these waste streams will adhere to all applicable State and Federal regulations including requirements for hazardous waste manifests with shipments, labeling or using placards, and emergency information requirements.

3.9.2.1.2 Mine Closure/Reclamation

Surface facilities, equipment, and buildings related to the proposed mining project would be removed as part of reclamation of the mine area after mining operations have ceased approximately 16 years from commencement. All hazardous materials would be removed using management procedures per Federal, State, and local regulatory requirements and as detailed in the SPCC.

Hazardous Materials/Hazardous Waste: Special materials on-site at the time of closure would be disposed of as follows:

- Asbestos-containing materials (ACMs) – A detailed survey of ACMs (e.g., pipe and electrical insulation in utility tunnels , siding, hot water heating system insulation, lube system insulation, floor tile) would be conducted prior to demolition. Appropriate controls would be put in place or ACMs would be removed intact, properly packaged, and disposed per NMED regulations and approval in the on-site demolition landfill. ACM locations in the landfill would be noted on the property deed. Any ACMs found in utility tunnels would be sealed before the utility tunnel is sealed.
- Partially used paint, chemical, and petroleum products would be collected and properly disposed.

The reagent suppliers, which would be under contract to NMCC, would remove any reagents remaining at closure. It would be the responsibility of the contractor to remove and properly dispose of nuclear density gauges per Federal and State regulations. In many cases, the suppliers of chemicals and equipment would be responsible for furnishing tanks, drums, or other storage devices, and would therefore be required to remove and dispose of those tanks during closure. Those tanks for which NMCC would be responsible would be demolished as follows:

- Tanks would be cleaned to remove remaining materials and sludge;
- Remaining materials and sludges and wash materials would be sent to an appropriate recycling or waste disposal facility;
- Large ASTs would be tested for lead paint prior to demolition; where found, disposal/recycling would be modified to accommodate the lead content;
- All tanks would be disassembled for disposal or recycling, as appropriate;
- Below-grade foundations would be left in place and buried; and
- Smaller ASTs would be cleaned and removed without disassembly.

No hazardous materials would be disposed of in the on-site landfill. No hazardous materials would remain at the Copper Flat project site.

Nonhazardous Solid Waste: Demolition waste such as asphalt, metals, and concrete would be removed and recycled to the extent possible. Demolition waste from structure removal that is not recycled would be disposed in the on-site landfill. Once demolition is completed, the solid waste landfill would be closed per NMED Solid Waste Bureau requirements. A post-closure care plan would be submitted as part of the facility permit for the mine landfill meeting the requirements of 20.9.6 NMAC. At closure, septic tanks and leach fields would be decommissioned.

3.9.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Short-term minor adverse effects would be expected under Alternative 1. The effects from mine development, operation, closure, and reclamation would be similar in nature to those outlined under the Proposed Action. Transportation shipments for waste removal and disposal, storage of hazardous materials, accidental spills or releases, and waste generation would be as described for the Proposed Action. Overall, these effects would not be significant.

As with the Proposed Action, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current Federal, State, and local regulatory requirements. These requirements, as well as all emission controls, and BMPs would be identical to those outlined under the Proposed Action.

3.9.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Short-term minor adverse effects would be expected under Alternative 2. The effects from mine development, operation, closure, and reclamation would be similar in nature to those outlined under the Proposed Action, with one exception. Following mine closure, the existing 20-inch water supply pipeline will be removed and disposed of as solid waste. Transportation shipments for waste removal and disposal, accidental spills or releases, storage of hazardous materials, and waste generation would be as described for the Proposed Action with the exception of sanitary waste management. Overall, these effects would not be significant.

A packaged water treatment plant would be installed at the mine to accommodate liquid sanitary wastes generated from the mine office, shower, and restroom facilities. The effluent would be treated and discharge would be to the lined TSF and recycled back to mill with the tailings process water, therefore effects of the plant would not be significant.

Hazardous materials would be transported and managed in the same way as described in the Proposed Action. As with the Proposed Action, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current Federal, State, and local regulatory requirements. These requirements, as well as all emission controls and BMPs would be identical to those outlined under the Proposed Action.

3.9.2.4 No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts resulting from hazardous materials.

3.9.3 Mitigation Measures

No mitigation measures for hazardous materials management beyond BMPs and regulatory requirements described in the Proposed Action have been identified for any alternative.

3.10 WILDLIFE AND MIGRATORY BIRDS

3.10.1 Affected Environment

The wildlife species found within a given area reflect the habitat characteristics of that location, such as vegetation. Vegetation and habitat are described in Section 3.11, Vegetation, Invasive Species and Wetlands. Parametrix, Inc. was contracted by NMCC to complete a wildlife assessment that included three target areas: 1) within the Copper Flat mine area; 2) in off-site reference areas; and 3) in the surrounding riparian habitats along Las Animas Creek and Percha Creek. The wildlife assessment included surveys for special status species; birds; large, medium, and small mammals; bats; and reptiles and amphibians. The original survey was expanded in 2014 to include 11 more sites (THEMAC 2015). The 11 sites include nine millsite claims plus two potential alternative sites under evaluation for electrical substation construction. The impact area of the proposed substation would be 30 acres. Threatened, endangered, and special status species are discussed in Section 3.12, Threatened, Endangered, and Species Status Species. The Parametrix report was completed in August 2011 and is also included as Chapter 5 of NMCC's Baseline Data Report (Intera 2012). This section presents the findings of that report as well as regional information from State and Federal land management agencies. Complete information about survey methodology and findings can be found in Parametrix, 2011. (See Appendix G.)

The mine is located within the Mexican Highlands section of the Basin and Range Physiographic Province (Fenneman and Johnson 1946). The dominant habitat sites are Creosote Rolling Upland and Grass Mountain (BLM), and Arroyos. Creosote Rolling Upland habitat type typically is considered a disclimax type or an alternate stable state resulting from conversion of grassland and is generally considered undesirable from a wildlife habitat perspective. Upland areas are drained by numerous arroyos and consist primarily of eroded soils and gravelly inclusions. The vegetative community is predominantly creosote and usually exist with a variety of sub-dominate species such as muhly grass, burro grass, tobosa grass, snakeweed, sumac species, and American tarbush. Grass Mountain habitat type occurs on slopes of mountain ranges above the surrounding uplands and typically supports a high percentage of grama grass species with inclusions of tobosa grass, Kentucky bluegrass, junegrass, and bluestem species. Shrubby vegetation is widely scattered and represented by banana yucca, pricklypear, mountain mohagony, ocotillo, oak species, beargrass, apache plume, rabbitbrush species, and sagebrush. Arroyo is defined as drainage with only a brief intermittent water flow supporting vegetation -non-characteristic of surrounding uplands. Grass and forb species are often sparse. Typical shrub and tree species include desert willow, hackberry, apache plume, soapberry species, salt cedar, littleleaf sumac, honey mesquite, and ash.

The majority of the proposed millsites are located in areas with existing developments such as production wells or monitoring wells and each of the sites is bisected by a road (THEMAC 2015). Affected habitats are primarily Chihuahuan desert scrubland with a plant community that has deviated from its ecological potential (as described in the ecological site report for Gravelly). However, small portions of the millsite boundaries include draws and arroyo habitats that contain relatively unique microhabitats for the area. As indicated by the results of this survey, the arroyo habitats and draws contain a higher biological diversity and abundance than the surrounding creosote flats (THEMAC 2015).

There are also heavily disturbed areas, some of which have been reclaimed (THEMAC 2012). There is relatively little water on the mine area, except for the man-made pit lake, the area immediately east of the tailing dam where surface water collects, a stock pond in the southern portion of the site, and intermittent pools created by storms in the bottom of Greyback Arroyo. Greyback Arroyo, though intermittent, does support some riparian vegetation such as willows and saltcedar, which provide important wildlife habitat.

Surveys were also conducted in Animas and Percha Creeks to be used as off-site reference areas to provide comparison areas with the Arroyo, creosote rolling upland, and grass mountain sites (Parametrix 2011). With the exception of the stock pond, most of the area has very little perennial water. Because of the presence of water at the pond, this location was chosen for bat surveys. During the 2010 and 2011 field surveys, 30 wildlife species or their signs were observed within the proposed mine area. All field surveys and methodologies are described in Parametrix 2011, THEMAC 2012, and THEMAC 2015.

3.10.1.1 Fisheries, Aquatic Invertebrates, and Aquatic Plants

The Baseline Data Report describes all wildlife surveys and includes a brief qualitative analysis of some of the seeps and springs in the area surrounding the mine area (Intera 2012). No fish surveys were included in the Sampling and Analysis Plan that drove baseline data collection (Intera 2012) because no fish habitat was located within the mine area. An attempt was made during summer 2011 to complete a qualitative wildlife habitat assessment at each of the springs that had been previously visited by hydrologists. At that time, private landowners did not grant the biologists permission to access the springs near Animas Creek or the cluster of springs near Warm Springs and Cold Springs Canyons. Permission to access the springs near Warm Springs and Cold Springs Canyon was later granted (May 2013), so a field biologist completed a qualitative resource survey at these sites, and also visited springs that were identified by hydrologists on public land just west of the mine permit and along Percha Creek. Biologists did not observe amphibians or fish within or near any of the springs, though an unidentified fish species was common in portions of Percha Creek (Intera 2012).

The riparian areas south and east of the proposed plant area are in the existing Greyback Arroyo channel. The Proposed Action does not change the flow of water through the diversion channel and Greyback Arroyo. Section 3.11, Vegetation, Invasive Species, and Wetlands, discusses wetland areas, including aquatic vegetation. Because flowing portions of Percha Creek would not be impacted by mining activities (see Section 3.6), the unidentified fish species would be unlikely to experience impacts from mining activities.

3.10.1.2 Birds, Including Migratory Species

Forty-six species of birds were identified on the assessment transects during the breeding season, and 8 additional species were encountered during other work and a winter bird survey (Parametrix 2011). The number of bird species recorded in the Parametrix study was 39 in the Arroyo habitat, 15 in the creosote rolling uplands, 38 in the grass mountain, 4 in the pit lake habitat, and 21 in the disturbed areas/waste rock pile habitat (Parametrix 2011). Thirty-four species were recorded during the millsite surveys (THEMAC 2015). The table below lists both the bird species recorded during the Parametrix surveys and the potential species based on the habitat present. (See Table 3-25.)

Seven cactus wren bird nests were identified within the mine area during the 2010 and 2011 biological surveys. During an August 2011 survey, an active raptor nest was observed in the windmill at well site MW-2, and there are additional structures on the project site that provide habitat for nesting birds.

Table 3-25. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
• = Recorded species; ○ = Not recorded but likely occurs in proper habitat								
Canada Goose								•
Gadwall								•
Mallard					○	○	○	•
Northern Shoveler								•
Northern Pintail								•
Green-winged Teal								•
Redhead					•			•
Ring-necked Duck								•
Common Merganser						•		•
Scaled Quail	○	○	○	○	○	○	○	•
Gambel's Quail		•			•	•	•	•
Montezuma Quail	○	○	○	○	•	○	○	•
Ring-necked Pheasant								•
Wild Turkey					•	•	○	○
Pied-billed Grebe								•
Black Crowned Night Heron		•				○		
Cattle Egret						○		
Snowy Egret					•		•	
Great Blue Heron	○	○	○	○	•	○	○	•
Green Heron					•			
White-faced Ibis						•		
Turkey Vulture		•				•	•	
Bald Eagle						•		•
Northern Harrier		○		○	•			•
Sharp-shinned Hawk	○	○	○	○	•	○	○	•
Cooper's Hawk	○	○	○	○	•	○	○	•
Swainson's Hawk		•					•	
Red-tailed Hawk	○	•	○	○	•	•	○	•
Ferruginous Hawk	○		○	○	○	•	○	•
Gray Hawk						•		
Zone-tailed Hawk					•	•		
Common Black Hawk					•	•		

Table 3-25. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek (Continued)

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
• = Recorded species; ○ = Not recorded but likely occurs in proper habitat								
Golden Eagle	○	○	○	○	•			
American Kestrel	○	•	○	○	•	○	•	•
Merlin	○		○	○	○		○	•
Peregrine Falcon					•	•		
Prairie Falcon	○	○	○	○				•
Sora					•			
American Coot						○		
Sandhill Crane							○	•
Killdeer	○	○	○	○	•	•	•	
Black-necked Stilt						○		
American Avocet						○		
Spotted Sandpiper	○	○	○	○		○		
Common Snipe						○		○
Ring-billed Gull								•
Rock Dove	○	○	○	○	○	○	○	•
Eurasian Collared-Dove	○	○	○	○	•	○	•	•
White-winged Dove	○	•	○	○	•	•	•	•
Mourning Dove					•	•	•	•
Common Ground Dove						○		
Yellow-billed Cuckoo						•		
Greater Roadrunner	○	•	○	○	•	○	○	•
Western Screech-Owl	○	○	○	○	•	○	○	•
Great Horned Owl	○	•	○	○	•	•	○	•
Barn Owl	○	○	○	○	○	○	○	•
Burrowing Owl	○					•		
Northern Pygmy Owl	○	○	○	○	○	○	○	•
Mexican Spotted Owl					•			
Elf Owl					•	•		
Lesser Nighthawk		○				•		
Common Poorwill		○			•	•		
White-throated Swift		•			•	•		
Black.-chinned Hummingbird		•			•	•	•	
Broad-tailed Hummingbird		•				•	•	
Belted Kingfisher					•	•	•	•
Lewis's Woodpecker								•

Table 3-25. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek (Continued)

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
• = Recorded species; ○ = Not recorded but likely occurs in proper habitat								
Acorn Woodpecker					•	•	•	•
Red-naped Sapsucker					•		•	•
Ladder backed Woodpecker					•	•		•
Downy Woodpecker	○	○	○	○	•	○	○	•
Hairy Woodpecker	○	○	○	○	•	○	○	○
Northern Flicker	○	•	○	○	•	○	•	•
Western Wood-Pewee		•				•	•	
Hammond's Flycatcher					•			•
Willow Flycatcher					•			
Brown-crested Flycatcher						•		•
Eastern Phoebe								•
Black Phoebe		•			•	•		•
Say's Phoebe	○	•	○	○	•	•	•	•
Vermilion Flycatcher		○			•	•		•
Ash-throated Flycatcher		•				•		
Dusky Flycatcher					•			
Cassin's Kingbird						•	•	
Western Kingbird		•				•	•	
Loggerhead Shrike	○	•	○	○	•	•	○	•
Bell's Vireo						•		
Plumbeous Vireo						•		
Warbling Vireo							•	
Hutton's Vireo		○		○			•	•
Steller's Jay								•
Western Scrub-Jay	○	○	○	○	○	○	•	•
American Crow	○	○	○	○	○	○		•
Chihuahuan Raven	○	○	○	○	•	○	•	•
Common Raven	○	•	○	○	•	○	•	•
Horned Lark	○	•	○	○	•	○	○	•
Northern Rough-winged Swallow		○			•	•		
Violet-green Swallow	○	•	○		•	•	○	
Barn Swallow	○	•	○		•	•	•	
Cliff Swallow		○				•		
Mountain Chickadee				○				•
Bridled Titmouse	○	○	○	○	•	•	○	•

Table 3-25. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek (Continued)

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
• = Recorded species; ○ = Not recorded but likely occurs in proper habitat								
Juniper Titmouse	○	•	○	○				•
Verdin	•				•		•	•
Bushtit	○	○	○	○	○	○	○	○
Red-breasted Nuthatch								•
White-breasted Nuthatch					•	•	•	•
Brown Creeper	○	○	○	○	○	○	○	•
Cactus Wren	○	•	○	○	•	○	•	•
Rock Wren	○	•	○	○	•			•
Canyon Wren	○	•	○	○		•		
Bewick's Wren	○	○	○	○	•	•	•	•
House Wren	○							•
Black-tailed Gnatcatcher	○					•		
Blue-Gray Gnatcatcher		○					•	
Golden-crowned Kinglet								•
Ruby-crowned Kinglet	○	○	○	○	•	○	○	•
Eastern Bluebird								•
Western Bluebird	○	○	○	○	•	○	○	•
Mountain Bluebird	○	○	○	○			•	
Townsend's Solitaire				○	•			•
Hermit Thrush					•			•
American Robin	○	•	○	○	•	•	○	•
Northern Mockingbird	○	•	○	○	•	•	○	•
Curve-billed Thrasher	○	•	○	○	•		•	•
Crissal Thrasher	○	•	○	○	•			•
Bendire's Thrasher								
European Starling	○	○	○	○	•	•	•	•
American Pipit								•
Sprague's Pipit			○					
Cedar Waxwing					•			•
Phainopepla	○	○	○	○	•	○	•	•
Orange-crowned Warbler	○	○	○				•	•
Blackthroated Gray Warbler	○				○			
Lucy's Warbler		○			•	•		
Virginia's Warbler		○			•		•	
Grace's Warbler						•		

Table 3-25. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek (Continued)

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
• = Recorded species; ○ = Not recorded but likely occurs in proper habitat								
MacGillivray's Warbler							•	
Northern Parula					•			
Yellow-rumped Warbler	○	•	○	○	•	○	•	•
Red-faced Warbler						•		
Wilson's Warbler	○	○	○				•	
Tennessee Warbler					•		•	
Yellow-breasted Chat		○				•		
Chestnut-collared Longspur								•
Canyon Towhee	○	•	○	○	•	•	•	•
Green-tailed Towhee		•						•
Spotted Towhee		•			•	○	○	•
Rufous-crowned Sparrow		•			•			•
Chipping Sparrow	○	○	○	○	•	○	○	•
Brewer's Sparrow	○		○	○	•		•	•
Vesper Sparrow	○	○	○	○				•
Lark Sparrow		○					•	
Black-throated Sparrow	○	•	○	○	•		•	•
Black-chinned Sparrow	○					•		
Sage Sparrow	○		○	○				•
Baird's Sparrow	○							•
Grasshopper Sparrow								•
Clay-colored Sparrow							○	•
Lark Bunting	○		○	○	•			
Indigo Bunting						•		
Lazuli Bunting					•			
Song Sparrow				○	•		•	•
Lincoln's Sparrow	○		○	○	•		•	•
White-crowned Sparrow	○		○	○	•		•	•
White-throated Sparrow								•
Swamp Sparrow								•
Dark-eyed Junco	○	○	○	○	•		•	•
Summer Tanager					•	•	•	•
Hepatic Tanager					•			
Western Tanager					•			

Table 3-25. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek (Concluded)

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
• = Recorded species; ○ = Not recorded but likely occurs in proper habitat								
Northern Cardinal						○		
Pyrrhuloxia	○	○	○	○	•	•		•
Blue Grosbeak		•			•	•	•	
Red-winged Blackbird	○	○	○	○	•	○	•	•
Western Meadowlark	○	•	○		•	○	○	•
Yellow-headed Blackbird	○	○		○				•
Brewer's Blackbird	○	○	○	○				•
Rusty Blackbird								•
Common Grackle					•			
Great-tailed Grackle	○	○	○	○	•	○	○	•
Brown-headed Cowbird		•				•		•
Hooded Oriole	○	○			•	•		
Bullock's Oriole	○	○					•	
Scott's Oriole	○	○				•		
Cassin's Finch		•	○	○				•
House Finch	○	•	○	○	•	•	•	•
Red Crossbill								•
Pine Siskin	○	○	○	○				•
Lesser Goldfinch		•			•	•	•	•
Lawrence's Goldfinch								•
American Goldfinch			○		•			•
House Sparrow		•			•	•	•	•

Source: Parametrix 2011.

3.10.1.3 Mammals

Mule deer (*Odocoileus hemionus*) signs were encountered on 16 of the 30 (53 percent) transects read. Most of the signs were in the western half of the mine area, in the grass mountains habitat, though signs were found in all parts of the mine. Deer were frequently observed in the Greyback Arroyo and other arroyos on the site. Desert cottontail (*Sylvilagus audubonii*) signs were found on 29 of 30 (97 percent) of the transects, black-tailed jackrabbit (*Lepus californicus*) signs were found in 23 of 30 (77 percent) of the transects, and predator or other signs were found on 4 of 30 (13 percent) of the transects. In addition, one pronghorn (*Antilocapra americana*) was encountered during walking the transects on the southeastern portion of the Copper Flat mine area. Also, signs of collared peccary (*Pecari tajacu*) mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), and fox (likely gray fox [*Urocyon cinereoargenteus*]) were noted during field work. Other large to medium mammals are likely present in the Copper Flat mine area but were not encountered. (See Table 3-26.) The list of these mammals was developed by consulting range maps and species lists in published reports, and by consulting with local experts (Parametrix 2011).

A total of 86 individuals of 8 species of small mammals were trapped at the Copper Flat mine area: brush mouse (*Peromyscus boylii*), desert cottontail, Merriam's kangaroo rat (*Dipodomys merriami*), Northern grasshopper mouse (*Onchomys leucogaster*), Mearn's grasshopper mouse (*Onychomys arenicola*), rock pocket mouse (*Chaetodipus intermedius*), white-footed mouse (*Peromyscus leucopus*), and white-throated woodrat (*Neotoma albigula*) (Parametrix 2011). Diversity of small mammals was highest in creosote rolling uplands, where six species were trapped. The greatest number of animals trapped per effort was in the Arroyo site, followed by the creosote rolling uplands and grass mountain sites. Diversity overall, however, was greatest in the creosote rolling uplands habitat, followed by the grassland and arroyo habitats. Although a relatively high density of individuals was trapped in the Arroyo, only two species were encountered: brush mouse and one unknown (escaped) species. Six species of small mammals were trapped in the creosote rolling uplands and five in the grass mountain.

A total of 12 species of bats was detected at the Copper Flat mine area, and at least 3 other species were not detected, but likely occur in the region and have appropriate habitat at or near the Copper Flat mine area (Parametrix 2011). Species that were detected but are of questionable occurrence (e.g., they would be very rare if detected) are denoted with a "?" (See Table 3-26.) The number of calls by species at each site was also analyzed to provide an index of short-term relative abundance. However, these results should be interpreted with caution as more calls does not necessarily correlate with more individuals using a site (for example, 100 calls could mean one bat calling 100 times or 100 bats calling once). However, it can be relatively safe to assume that more calls and more activity indicate a higher density of prey. The most species and most calls were detected at the pit lake, where insects provide the greatest feeding opportunities. The second highest abundance and diversity of calls were from the grass mountain, followed by the Arroyo. In addition to feeding habitat at the lake, roosting habitat is provided by crevices in the rocky hills at the Copper Flat mine area and, probably more importantly, by the many abandoned mine shafts. A thorough survey of shafts was not conducted for bat activity.

Table 3-26. Mammal Species Recorded or Possible at Copper Flat Mine Area, Las Animas Creek, and Percha Creek

Table 3-26. Mammal Species Recorded or Possible at Copper Flat Mine Area, Las Animas Creek, and Percha Creek			
Species	**Scientific Name**	**Encountered or Possible at Copper Flat Mine Area**	**Known or Possible at Las Animas/ Percha Creeks**
• = Detected; ○ = Not detected but habitat present and species occurs in the region			
Large Mammals			
Pronghorn	*Antilocapra americana*	•	
Coyote	*Canis latrans*	•	•
Elk	*Cervus elaphus*	○	•
Bobcat	*Lynx rufus*	•	•
Mule Deer	*Odocoileus hemionus*	•	•
White Tailed Deer	*Odocoileus virginianus*		○
Collared Peccary	*Pecari tajacu*	○	•
Mountain Lion	*Puma concolor*	•	•
Gray Fox	*Urocyon cineroargenteneus*	•	•

Table 3-26. Mammal Species Recorded or Possible at Copper Flat Mine Area, Las Animas Creek, and Percha Creek (Continued)

Species	Scientific Name	Encountered or Possible at Copper Flat Mine Area	Known or Possible at Las Animas/ Percha Creeks
• = Detected; ○ = Not detected but habitat present and species occurs in the region			
American Black Bear	*Ursus americanus*	○	•
Bats			
Pallid Bat	*Antorzus pallidus*	•	•
Townsend's Pale Big-eared Bat	*Corynorhinus townsendii*	•	○
Big Brown Bat	*Eptesicus fuscus*	•	•
Spotted Bat	*Euderma maculatum*	○	○
Allen's Big-eared Bat	*Idionycteris phyllotis*	○	○
Silver-haired Bat	*Lasionycteris noctivagans*	•	•
Western Red Bat	*Lasiurus blossevillii*	•	○
Southern Hoary Bat	*Lasiurus cinereus*	•	•
Southwestern Myotis	*Myotis auriculus*	○	○
California Myotis	*Myotis californicus*	•	•
Arizona Myotis	*Myotis occultus*		○
Fringed Myotis	*Myotis thysanodes*	•	•
Long-legged Myotis	*Myotis volans*	•	○
Yuma Myotis	*Myotis yumanensis*	•	•
Canyon Bat	*Parastrellus hesperus*	•	○
Brazilian Free-tailed Bat	*Tadarida brasiliensis*	•	•
Medium-sized Mammals			
Ringtail	*Bassariscus astutus*		○
Coatimundi	*Nasua narica*		○
American Beaver	*Castor canadensis*		○
American Hog-nosed Skunk	*Conepatus leuconotus*	○	○
Black-tailed Jackrabbit	*Lepus californicus*	•	○
Hooded Skunk	*Mephitis macroura*	○	○
Striped Skunk	*Mephitis mephitis*	○	○
Long-tailed Weasel	*Mustela frenata*	○	○
Raccoon	*Procyon lotor*	○	○
Western Spotted Skunk	*Spilogale gracilis*	○	○
Desert Cottontail	*Sylvilagus audubonii*	•	○
Kit Fox	*Vulpes macrotis*	○	
American Badger	*Taxidea taxus*	○	○

Table 3-26. Mammal Species Recorded or Possible at Copper Flat Mine Area, Las Animas Creek, and Percha Creek (Concluded)

Species	Scientific Name	Encountered or Possible at Copper Flat Mine Area	Known or Possible at Las Animas/ Percha Creeks
• = Detected; ○ = Not detected but habitat present and species occurs in the region			
Small Mammals			
Merriam's Kangaroo Rat	*Dipodomys merriami*	•	○
Ord's Kangaroo Rat	*Dipodomys ordii*	○	○
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*	○	○
North American Porcupine	*Erethrizon dorsaturn*		○
Mogollon Vole	*Microtus mogollonensis*	○	
House Mouse	*Mus musculus*	○	○
White-throated Woodrat	*Neotoma albigula*	•	○
Mexican Woodrat	*Neotoma mexicana*	○	
Southern Plains Woodrat	*Neotoma micropus*	•	
Desert Shrew	*Notiosorex crawfordi*	○	○
Mearn's Grasshopper Mouse	*Onchomys arenicola*	•	
Northern Grasshopper Mouse	*Onchomys leucogaster*	•	○
Silky Pocket Mouse	*Peognathus flavus*	•	
Brush Mouse	*Peromyscus boylii*	•	
Cactus Mouse	*Peromyscus eremicus*	○	
White-footed Mouse	*Peromyscus leucopus*	•	○
Piñon Mouse	*Peromyscus truei*	○	
Western Harvest Mouse	*Reithrodontomys megalotis*	○	○
Arizona Gray Squirrel	*Sciurus arizonensis*		○
Tawny-bellied Cotton Rat	*Sigmodon fulviventer*		○
Hispid Cotton Rat	*Sigmodon hispidus*		○
Spotted Ground Squirrel	*Spermophilus spilosoma*	○	
Rock Squirrel	*Spermophilus variegatus*	○	○
Cliff Chipmunk	*Tamias dorsalis*	○	
Botta's Pocket Gopher	*Thomomys bottae*	○	

Source: Parametrix 2011.

3.10.1.4 Reptiles and Amphibians

Pitfall and funnel trapping of reptiles and amphibians was not successful. Mine area soils were too rocky to effectively dig pitfall traps, and constructed wire mesh funnel traps failed to trap any reptiles. During walking transects and other survey efforts, nine species of reptiles were encountered at the mine area: coachwhip (*Masticophis flagellum*), whiptail lizard (*Cnemidophorus* sp.), bullsnake (*Pituophis melanoleucus*), Texas horned lizard, roundtail horned lizard (*Phrynosoma modestum*), desert spiny lizard (*Sceloporus magister*), black-tailed rattlesnake (*Crotalus molossus*), lesser earless lizard (*Holbrookia maculata*), and rock rattlesnake (*Crotalus lepidus*). Whiptails were the most abundant species seen, but field staff were unable to capture one to identify the species (six species occur in Sierra County). Parametrix (2011) also identified likely or possibly occurring species at the mine area based on expected range and the habitat present. Up to 43 species of reptiles and amphibians that are known to occur in Sierra County have suitable habitat present at the mine area. (See Table 3-27.)

Table 3-27. Reptile and Amphibian Species Recorded or Possible at Copper Flat Mine Area, Las Animas Creek, and Percha Creek

Table 3-27. Reptile and Amphibian Species Recorded or Possible at Copper Flat Mine Area, Las Animas Creek, and Percha Creek			
Species	**Scientific Name**	**Copper Flat Mine Area**	**Las Animas or Percha Creeks**
• = Encountered; ○ = Not encountered but habitat present and species occurs in Sierra County			
Salamanders			
Tiger Salamander	*Ambystoma tigrinum*	•	•
Frogs and Toads			
Couch's Spadefoot Toad	*Scaphiopus couchii*	○	○
Plains Spadefoot	*Spea bombifrons*	○	
New Mexico Spadefoot	*Spea multiplicata*	○	○
Great Plains Toad	*Bufo congnatus*	○	○
Green Toad	*Bufo debilis*	○	
Arizona Toad	*Bufo microscaphus*		○
Red-spotted Toad	*Bufo punctatus*	○	○
Woodhouse's Toad	*Bufo woodhouseii*	○	○
Canyon Tree Frog	*Hyla arenicolor*		•
Bullfrog	*Rana catesbiana*		•
Chiricahua Leopard Frog	*Rana chiricahuensis*		•
Plains Leopard Frog	*Rana blairi*		•
Northern Leopard Frog	*Rana pipiens*		○
Turtles			
Ornate Box Turtle	*Terrapene ornata*		○
Lizards			
Collared Lizard	*Crotaphytus collaris*	○	○
Greater Earless Lizard	*Cophosaurus texanus*	○	
Lesser Earless Lizard	*Holbrookia maculata*	•	
Texas Horned Lizard	*Phrynosoma cornutum*	•	
Short-horned Lizard	*Phrynosoma douglasii*	•	
Roundtail Horned Lizard	*Phrynosoma modestum*	•	
Clark's Spiny Lizard	*Sceloporus clarkii*	○	
Desert Spiny Lizard	*Sceloporus magister*	•	
Crevice Spiny Lizard	*Sceloporus poinsetti*	○	
Prairie Lizard	*Sceloporus undulatus*	○	○
Tree Lizard	*Urosaurus ornatus*	○	○
Side-blotched Lizard	*Uta stansburiana*	•	
Chihuahuan Spotted Whiptail	*Cnemidophorus exsanguis*	○	○

Table 3-27. Reptile and Amphibian Species Recorded or Possible at Copper Flat Mine Area, Las Animas Creek, and Percha Creek (Concluded)			
Species	**Scientific Name**	**Copper Flat Mine Area**	**Las Animas or Percha Creeks**
• = Encountered; ○ = Not encountered but habitat present and species occurs in Sierra County			
Checkered Whiptail	*Cnemidophorus grahamii*	○	○
Little Striped Whiptail	*Cnemidophorus inornatus*	○	
New Mexico Whiptail	*C. neomexicanus*	○	
Western Whiptail	*Cnemidophorus tigris*	○	
Desert Grassland Whiptail	*Cnemidophorus uniparens*	○	○
Many-lined Skink	*Eumeces multivirgatus*		○
Great Plains Skink	*Eumeces obsoletus*	○	○
Madrean Alligator Lizard	*Elgaria kingii*	○	○
Snakes			
Texas Blind Snake	*Leptotyphlops dulcis*	○	
Western Blind Snake	*Leptotyphlops humilis*	○	
Glossy Snake	*Arizona elegans*	○	
Ringneck Snake	*Diadophus punctatus*		○
Western Hooknose Snake	*Gyalpion canum*	○	
Western Hognose Snake	*Heterodon nasicus*	○	
Night Snake	*Hypsiglena torquata*	○	○
Common Kingsnake	*Lampropeltis pyromelana*		○
Coachwhip	*Masticophus flagellum*	•	
Striped Whipsnake	*Masticophus taeniatus*	○	
Gopher Snake	*Pituophis melanoleucus*	•	○
Longnose Snake	*Rhinochelius lecontei*		○
Big Bend Patchnose Snake	*Salvadora deserticola*	○	
Mountain Patchnose Snake	*Salvadora grahamiae*	○	
Ground Snake	*Sonora semiannulata*		○
Plains Black-headed Snake	*Tantilla nigriceps*	○	
Blackneck Garter Snake	*Thamnophis cyrtopsis*		○
W. Terrestrial Garter Snake	*Thamnophis elegans*		○
Checkered Garter Snake	*Thamnophis marcianus*		○
Lyre Snake	*Trimorphodon biscutatus*	○	
W. Diamondback Rattlesnake	*Crotalus atrox*	○	○
Rock Rattlesnake	*Crotalus lepidus*	•	
Blacktail Rattlesnake	*Crotalus molossus*	•	○
Western Rattlesnake	*Crotalus viridis*	○	
Massassagua Rattlesnake	*Sistrurus catenatus*	○	

Source: Parametrix 2011.

3.10.2 Environmental Effects

3.10.2.1 Proposed Action

Impacts from mining activities would result largely from: 1) the conversion of habitat and forage areas and 2) noise and light disturbances from mining activities. Habitat conversion can result in either: 1) adverse impacts from the loss or degradation of habitat or from fragmenting large sections of habitat; or 2) habitat enhancement from maintenance and reclamation activities that focus on providing natural and native habitat for wildlife species. Habitat fragmentation is the process by which habitat loss results in the division of large, continuous habitats into smaller, more isolated remnants (Didham 2010). This fragmentation reduces the total amount of usable habitat for wildlife species and disrupts movement among habitat areas. In addition, habitat fragmentation causes the isolation of less mobile species, a decline in habitat specialists, and facilitates invasion by generalist species (Marvier et al. 2004). Habitat alteration occurs when surface-disturbing activities directly or indirectly change the composition, structure, or functioning of the habitat. Habitat loss is caused by surface-disturbing activities or other activities that degrade or remove habitat. Habitat displacement occurs when land-use activities force wildlife or special status species to move into other habitats, thereby increasing stress on individual animals and increasing competition for habitat resources. Any surface-disturbing actions could lead to habitat alteration, fragmentation, displacement, or loss; limit the amount of usable habitat for special status species and wildlife; and restrict movement among habitat areas.

This section covers species that are not considered Special Status, meaning Federally or State threatened or endangered. It covers species that are generally common; as such, if individual members of these species are killed, displaced, or if their habitat is altered, it is unlikely that the species or populations would be significantly impacted as a whole. Impacts to wildlife special status species are reviewed in Section 3.12, Threatened, Endangered, and Special Status Species. However, both direct and indirect impacts to wildlife species are expected to result from minerals development, construction activities, and from traffic changes on the coal haul transportation route, all of which could affect individuals, populations, or habitat conditions.

For migratory bird species, loss of habitat would reduce forage, cover, perches, and nesting areas. Most surface disturbance under the Proposed Action would occur in or adjacent to previously disturbed areas. Because these areas have experienced disturbance and the poor quality soils are slow to recover, it is unlikely these areas contain high quality foraging or nesting habitats for migratory birds and other wildlife species.

3.10.2.1.1 Mine Development and Operation

Mine construction would take 2 years and operations would occur for 16 years. It is probable that small to large medium- and long-term minor adverse effects would be expected under the Proposed Action. Most of these impacts would be due to habitat loss and may be reversed during mining reclamation. The Copper Flat project site would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment, and land uses of the area. Because reclamation includes the entire mine area and 52 percent of the area consists of previously disturbed land, conversion to natural habitat would have long-term minor and beneficial impacts to wildlife and migratory birds due to the increase in potential habitat and habitat connectivity. These beneficial impacts would not occur until after the completion of reclamation, but would be long-term starting at that point. Common species are expected to return to the mining area in the long term after reclamation occurs.

Land Conversion: Some mining facilities already exist in the mine area. The mining pit would be enlarged to approximately 2,800 feet by 2,800 feet with an ultimate depth of approximately 900 feet. The area of the pit would be expanded from 102 acres to 119 acres. The existing diversion of Greyback

Wash, which is south of the pit, would not be altered with the proposed pit expansion. For the Proposed Action, approximately 57 percent of the proposed disturbance would take place in areas disturbed during the previous operations. New disturbance of previously undisturbed land would be kept to a minimum. Approximately 37 percent of the new disturbance would be related to the tailings and waste rock facilities. The utility corridor, access road, and surface water diversions were developed during the previous operations and no further disturbance is anticipated with these facilities. The majority of the haul roads were also developed during previous operations and only minor additional disturbance would be related to haul road construction.

Noise and Light Disturbance: Noise would occur from mine operation machinery, blasting, and vehicles. Blasting would be limited to daylight hours and performed by licensed blasters. Noise can impact species by startling individuals or masking natural sounds that animals are generating or hearing (Blickley and Patricelli 2010). These impacts result in displacing wildlife species directly or interfering with wildlife communication both between members of the same species and between individuals of different species (such as predator-prey interactions). Noise is discussed fully in Section 3.21, Noise and Vibrations, but impacts in general are expected to be minor, long-term, and adverse for wildlife species.

Artificial night lighting affects animal foraging behavior, reproduction, movement, and species interactions (such as predator-prey and pollinator-plant relationships) (Longcore and Rich 2004). Bats and other nocturnal mammals respond to increased nighttime light by reducing or shifting their periods of activity, traveling shorter distances, and consuming less food (Longcore and Rich 2005). Diurnal (day-active) and nocturnal wildlife could be attracted to, or displaced from, habitats affected by night lighting. Bat species are likely to be attracted to insect activity around lights and could benefit from concentrated prey. However, night lighting increases the risk of predation for small, nocturnal mammals and decreases food consumption when animals reduce foraging activities to remain concealed in an artificially lit environment (Beier 2005). Night lighting may also increase the risk of animal mortality from vehicle collisions (Longcore and Rich 2005).

3.10.2.1.2 Mine Closure/Reclamation

The Copper Flat project site would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment, and land uses of the area. Careful consideration would be given to neighbors regarding their land use requirements including cattle grazing, alternate energy generation such as wind and solar, and reestablishment and enhancement of original botanical and zoological species inhabitants. The objective of the reclamation plan is to return the project site to conditions similar to those present before the reestablishment of the mine. One goal of the reclamation plan is to revegetate disturbed areas with a diverse mixture of appropriate plant species in order to achieve a self-sustaining ecosystem or other approved post-mining land use.

The post-closure monitoring period includes the final abandonment of monitoring wells and reclamation of access roads used for power, and water utilities. Reclamation and revegetation would stabilize exposed soil and control fugitive dust emissions. As vegetation becomes established, particulate emission levels would return to what is typical for a dry, desert environment. Equipment use, vehicular traffic, and associated disturbances would decrease following mine closure and essentially cease following the post-closure assessment period.

Contemporaneous reclamation of disturbed surface areas would be an integral part of the mining operation. Both public and private land would be reclaimed. At the completion of mining activities, the site would be restored to conditions and standards that meet approved post-mining land uses. These uses would include native plant communities similar to surrounding undisturbed areas for wildlife habitat, and grazing land potentially suitable for livestock. Once reclamation is successfully completed, wildlife populations would be expected to return to existing (i.e., pre-mining operation) levels.

Based on 2010 and 2011 field surveys and a review of the project description, the following list gives examples of impacts that would potentially occur to biological resources present within the mine area, though ongoing monitoring would continually assess actual impacts.

- Direct and long-term adverse impacts from habitat conversion would occur during project activities, as brush would be cleared along existing access roads. Impacts during the lifespan of the Proposed Action would mostly occur on previously disturbed land.
- Losses of mammals, birds, or wildlife in general are not expected to be significant as a result of the project. Proposed project activities may cause minor disruptions to foraging, migratory movement, or breeding behavior of some species. A few animals may be killed during these activities because they are driven out of their foraging territories and are made more susceptible to predation, but these losses would not be expected to impact the species as a whole. There is currently a vast amount of undeveloped land in nearby areas where wildlife can temporarily relocate for cover and foraging.
- Bats were identified at the pit lake by their vocalizations. Mining operations require that the pit lake be pumped out and the bottom of the pit kept dry. Pumping of the pit lake would therefore be necessary prior to mining and continuously throughout the life of the mine. Reducing the lake size may reduce insect forage and water availability for bat species, which could result in minor negative impacts to some bat species. The Ground Water Quality Bureau of NMED requires a monthly report of tonnages of tailings discharged along with analyses of the tailings to identify possible contaminants. These samples would be used to identify any leakage from the new, lined TSF. Abatement plans would be implemented should leakage and contamination be detected to prevent impacts to wildlife such as bats from contamination (THEMAC 2011).
- The Proposed Action calls for pumping water from the pit lake due to inflow, which was measured at an average of 24 gpm during previous mining operations. Hydrogeologic and geochemical modeling indicates the post-closure pit lake water quality should be similar to that of the current pit lake. Sanitary liquid waste would be disposed of in leach fields and septic tanks. During the course of operations, NMCC would periodically review and update the geochemical and hydrogeological predictions, mine waste characterization studies, and pit lake studies to incorporate new information accumulated during operations. With the use of BMPs, the pit lake should not be contaminated in a way that would cause adverse effects on wildlife.
- None of the wren nests were located within the area proposed for vegetation clearing on existing access roads (Parametrix 2011). The raptor nest at well site MW-2 would not be removed or disturbed, and none of the Proposed Actions would be expected to affect the nest.
- Due to the presence of bird nests in the proposed project corridor, clearing of vegetation should take place outside of the bird breeding season (roughly March through August) (Parametrix 2011). If this is not possible due to scheduling concerns, a pre-construction nest survey conducted by a qualified biologist is recommended. If active bird nests would be affected by construction, then coordination with the U.S. Fish and Wildlife Service (USFWS) is required and a permit must be obtained in order to move or disturb active nests.
- Designated critical habitat for the southwestern willow flycatcher occurs many miles northeast of the project corridor; the species would not be affected by project activities (Parametrix 2011).

3.10.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The effects from mine development, operation, closure, and reclamation would be similar in nature and level as the Proposed Action. As with the Proposed Action, mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements and with compliant practices and products. These requirements, as well as BMPs and mitigation measures, would be identical to those outlined under the Proposed Action. As with the Proposed Action, and for the same reasons, impacts during mining construction, operation, and active reclamation would be expected to be minor, long-term, and adverse. Post-reclamation impacts would be expected to be minor, long-term, and beneficial.

3.10.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The effects from mine development, operation, closure, and reclamation would be similar in nature and level as Alternative 1. As with the Proposed Action and Alternative 1, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements, with compliance practices and products. These requirements, as well as BMPs and mitigation measures, are identical to those outlined under the Proposed Action. As with the Proposed Action, and for the same reasons, impacts during mining construction, operation, and active reclamation would be expected to be minor, long-term, and adverse. Post-reclamation impacts would be expected to be minor, long-term, and beneficial.

3.10.2.4 No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action to wildlife and migratory bird species. No new impacts would be anticipated beyond current conditions.

3.10.3 Mitigation Measures

The following BMPs would be required and implemented for activities associated with the Proposed Action.

Fencing: As part of the proposed action, NMCC would construct BLM-approved barbed wire fencing to prevent livestock from entering the pit, WRDFs, and TSFs including the seepage collection pond. Wildlife fences would be constructed around the lined ponds. In addition to wildlife fencing, to the extent practicable, NMCC would investigate and utilize other mitigation actions, such as exclusionary devices. These devices could include, but are not necessarily limited to, bird balls and netting to minimize the potential for avian wildlife contacting process pond waters that contain elevated chemical constituents in excess of ecological risk levels. Pending monitoring information, either gates or cattle guards or both would be installed along roadways within the proposed mine area as appropriate.

3.11 VEGETATION, INVASIVE SPECIES, AND WETLANDS

3.11.1 Affected Environment

The Copper Flat mine area is located within the foothills of the Black Range, which is a major north-south mountain chain in south-central New Mexico. To the west, the Black Range rises sharply above the Rio Grande Valley and Caballo Reservoir, which lie east of the Copper Flat mine area. The vegetation of the Copper Flat mine area is typical Chihuahuan Desert shrubland in the lower elevations with an increasing grass component evident as elevations and slope increase. Much of the approximately 2,200-acre area was previously disturbed during mining ventures. Mining activities and infrastructure, combined with previous mining-related activities, have contributed to the disturbance of approximately 690 acres within the Copper Flat mine area (THEMAC 2011). Calculations based on digitized high-resolution 2009 aerial photography indicate that the total existing disturbed area is 910 acres, or 41.6 percent of the total proposed mine area (THEMAC 2011).

Some of the previously disturbed mine area has been reclaimed. There are no definitive records of the reclamation efforts that occurred after the Quintana operation, although from a review of correspondence it appears that some reclamation was conducted in either 1987 or 1988 (Emmer 2014), and active revegetation was inconsistent, patchy, and yielded variable results. Reseeding efforts were to be limited to 46 acres in the north tailings pond and 8 acres to the east side of the plant site yard. The majority of disturbed land at the proposed mine site is currently sparsely covered by vegetation.

Vegetation data within the proposed mine boundary, pipeline boundary, Percha Creek, and Las Animas Creek were collected and described by Parametrix, Inc. within the 2010 and 2011 growing seasons. Both a noxious weed survey and wetland survey were also conducted. However, because the 2010 growing season was wetter than average, the vegetation cover and production results could be inflated (THEMAC 2011). Information gathered during these surveys provides the baseline data for the proposed mine area, Las Animas Creek, and Percha Creek.

As described in Chapter 2, there are 9 individual 5-acre millsite parcels (45 acres total) outside the mine area but essential to mining operations that would be used for staging, equipment, well pads, booster tanks, pumping systems, truck access, and structures to maintain the water supply pumping stations. There is also a 30-acre area where an electrical substation would be built to supply the increased power needed for accelerated processing under Alternative 2. This section is supplemented with vegetation data from a 2015 survey performed for the 9 individual 5-acre millsites and the 30-acre electrical substation area.

Endangered, threatened, and special status plant species are discussed in Section 3.12, Threatened, Endangered and Special Status Species.

3.11.1.1 Mine Area Boundary

Within the proposed mine area boundary, there are highly disturbed areas as a result of previous mining activity with little to no vegetation in places and areas where topsoil is gone. Some areas remain completely denuded of vegetation, even after many years of mine inactivity. Areas where the rehabilitation (seeding) took place, as well as areas on the periphery of the mining activity that were disturbed to a lesser degree, retain topsoil and support healthy stands of vegetation. Outside the mine area boundary, relatively intact vegetation communities are present.

The history of repeated disturbance in the mine area has dramatically affected vegetation communities. Current vegetation community distribution in the previously mined areas is perhaps more strongly correlated with previous land use than with the biotic or abiotic factors that typically render the distribution of vegetation types or vegetation potential. The "baseline" vegetation condition for portions of the mine area include: a tailing dam, barren areas, various roads, a diversion channel, pit and pit lake, waste rock piles, prospector mining disturbance, grazing, and other disturbed areas. However, relatively intact vegetation communities are also still present within the mine area.

The vegetation of the mine area has been classified variously as semi-desert grassland and steppe (USGS 2004), Chihuahuan desert shrubland (Dick-Peddie 1993), and Hills Ecological Site (NRCS 2014). Using the data in Appendix G for the purposes of this analysis, the area has been determined by the BLM to be best characterized as a grassy hills area, a shrubland area, and an arroyo/riparian area. There is a significant difference in shrub density, grass cover, and species diversity among the tailings dam, waste rock pile, grassy hills, shrubland, and arroyo/riparian land cover types (THEMAC 2011). Vegetation communities and vegetation found within each land cover type are discussed below. The type of vegetation and land cover, the acreage and percentage of each vegetation and land cover type, and the total aerial cover of each vegetation land cover type are listed below. (See Table 3-28.) The distribution of these major vegetation and land cover types are also listed below. (See Figure 3-26.) The table and figure are followed by a description of the vegetation data found within the proposed mine area boundary. The presence of wetlands within the proposed mine area boundary is also discussed.

Table 3-28. Vegetation Cover Types Within the Proposed Mine Area

Table 3-28. Vegetation Cover Types Within the Proposed Mine Area

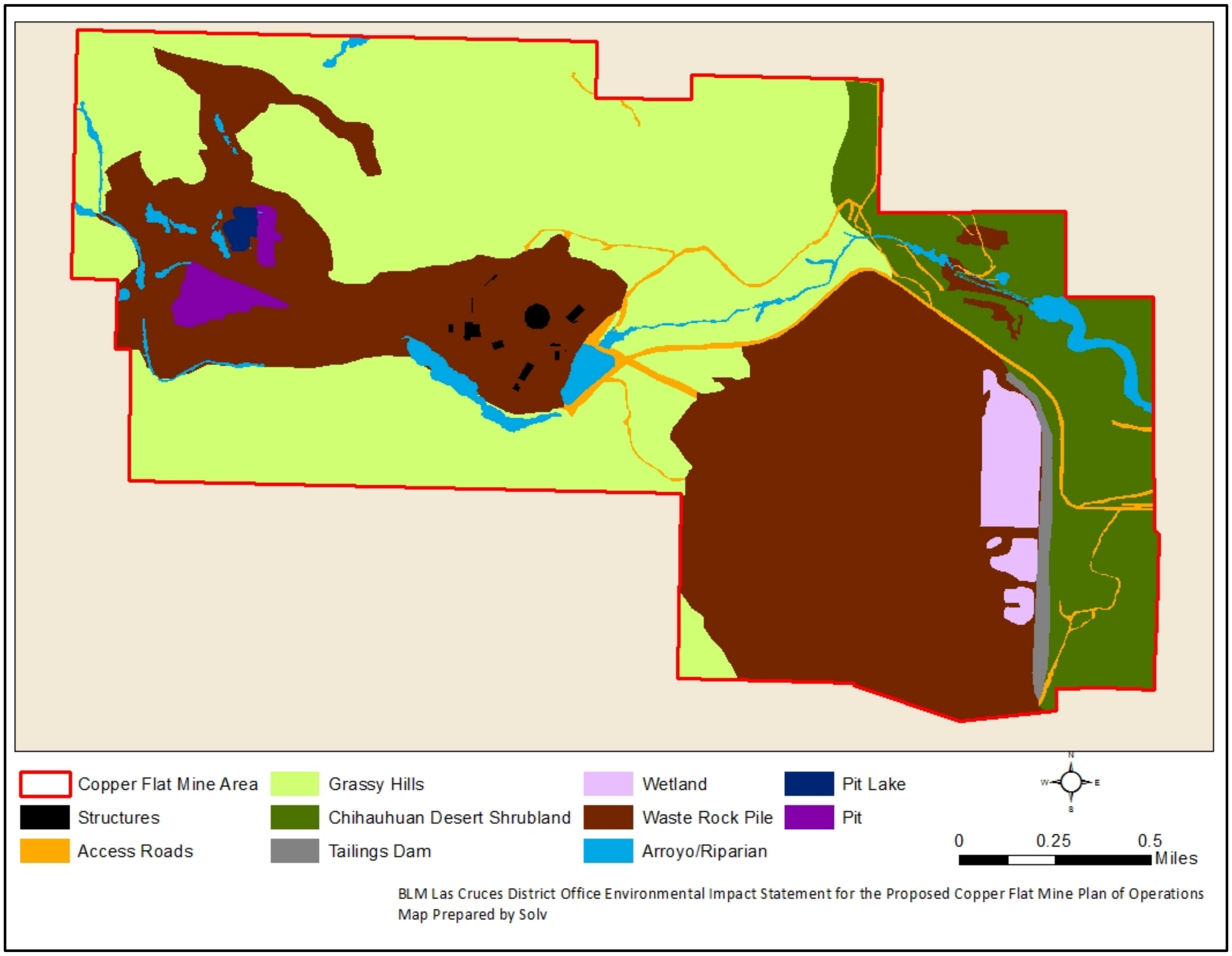
Land Cover	Acreage (Percent)	Total Vegetation Cover (Percent)
Grassy hills	932.9 (42.6)	64
Chihuahuan desert shrubland	260.9 (11.9)	42
Arroyo riparian	50.5 (2.3)	25
Access road*	36.5 (1.7)	--
Pit	21.4 (1)	4
Pit lake*	5 (0.23)	--
Tailing dam	16.6 (0.76)	34
Disturbed areas/waste rock piles	865.7 (39.5)	39

Source: THEMAC 2011.

Note: *Land cover types devoid of vegetation.

Grassy Hills: Grassy hills cover 932.9 acres (or 42.6 percent) of the proposed mine area, making it the most abundant vegetative community, albeit highly disturbed. It is dominated by warm season grasses with typical northern Chihuahuan Desert shrubs. Two grass species, black grama (*Bouteloua eriopoda*) and side oats grama (*B. curtipendula*), are the most abundant. Other perennial grass species found in this area include tobosa grass (*Pleuraphis mutica*), Harvard's three-awn grass (*Aristida harvardii*), cane bluestem (*Bothriochloa barbinodis*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsute*), and fluff grass (*Dasyochloa pulchella*). The most abundant annual species found in this community is threadstem chinchweed (*Pectis filipes*). Shrubs include broom snakeweed (*Gutierrezia sarothrae*), cat-claw mimosa (*Mimosa aculeaticarpa*), honey mesquite (*Prosopis glandulosa*), spiny dogweed (*Thymophylla acerosa*), and creosote bush (*Larrea tridentata*). In areas devoid of vegetation, litter (partly decomposed leaves, twigs, or other plant parts), and cobble-sized rock are evenly distributed across the ground. Small oak or netleaf hackberry (*Celtis laevigata*) woodlands are present in isolated drainages on the northern and western portions of the proposed mine area. One-seed juniper (*Juniperus monosperma*) is most common on hill slopes with a north-facing aspect on the western half of the site (THEMAC 2011).

Figure 3-26. Land Cover Map of the Proposed Mine Area



Source: THEMAC 2011.

Chihuahuan Desert Shrubland: Shrubland covers 260.9 acres (or 11.9 percent) of the proposed mine area and is composed primarily of shrub species characteristic of the Chihuahuan Desert. This area has experienced limited disturbance, except from grazing and isolated pockets of prospector mining. The most prominent shrub species found within this vegetative community are honey mesquite, tarbush (*Flourensia cernua*), and creosote bush. Grass species composition is relatively even and includes black grama grass, side oats grama, fluff grass, bushy muhly grass (*Muhlenbergia porteri*), and tobosa grass. The most common perennial forb is small whitemargin sandmat (*Chamaesyce albomarginata*). Annual plant species include six weeks grama (*Bouteloua barbata*) and woolly honeysweet (*Tidestromia lanuginosa*) (THEMAC 2011).

Arroyo/Riparian: Arroyo areas within the proposed mine boundary occur along Greyback Arroyo, the diversion channel, and pit lake. The arroyo vegetative cover has the highest woody plant density within the proposed mine area. The majority of vegetation within this land cover consists of shrubs, with Emory's baccharis (*Baccharis emoryi*) being the most abundant. Burro bush (*Hymenoclea monogyra*) is also frequent in Greyback Arroyo. Grasses make up 24 percent of the relative vegetation cover, with vine mesquite (*Panicum obtusum*) being the most abundant. Other vegetation found in Greyback Arroyo includes desert willow (*Chilopsis linearis*), Goodding's willow (*Salix gooddingii*), cottonwood, fourwing saltbush (*Atriplex canescens*), and the noxious weed saltcedar (*Tamarix* spp.).

A small cattail community was found along the fringe of the pit lake, and although no open water was present in this community during mine area surveys, it had relatively high soil moisture. Cottonwood (*Populus fremontii*), Goodding's willow, netleaf hackberry, Emory's oak (*Quercus emoryi*), honey mesquite, saltcedar, Apache plume (*Fallugia paradoxa*), rubber rabbitbrush (*Ericameria nauseousus*), velvet ash (*Fraxinus velutina*), single soapberry (*Sapindus saponaria*), and little walnut (*Juglans microcarpa*) were also encountered in this area (THEMAC 2011).

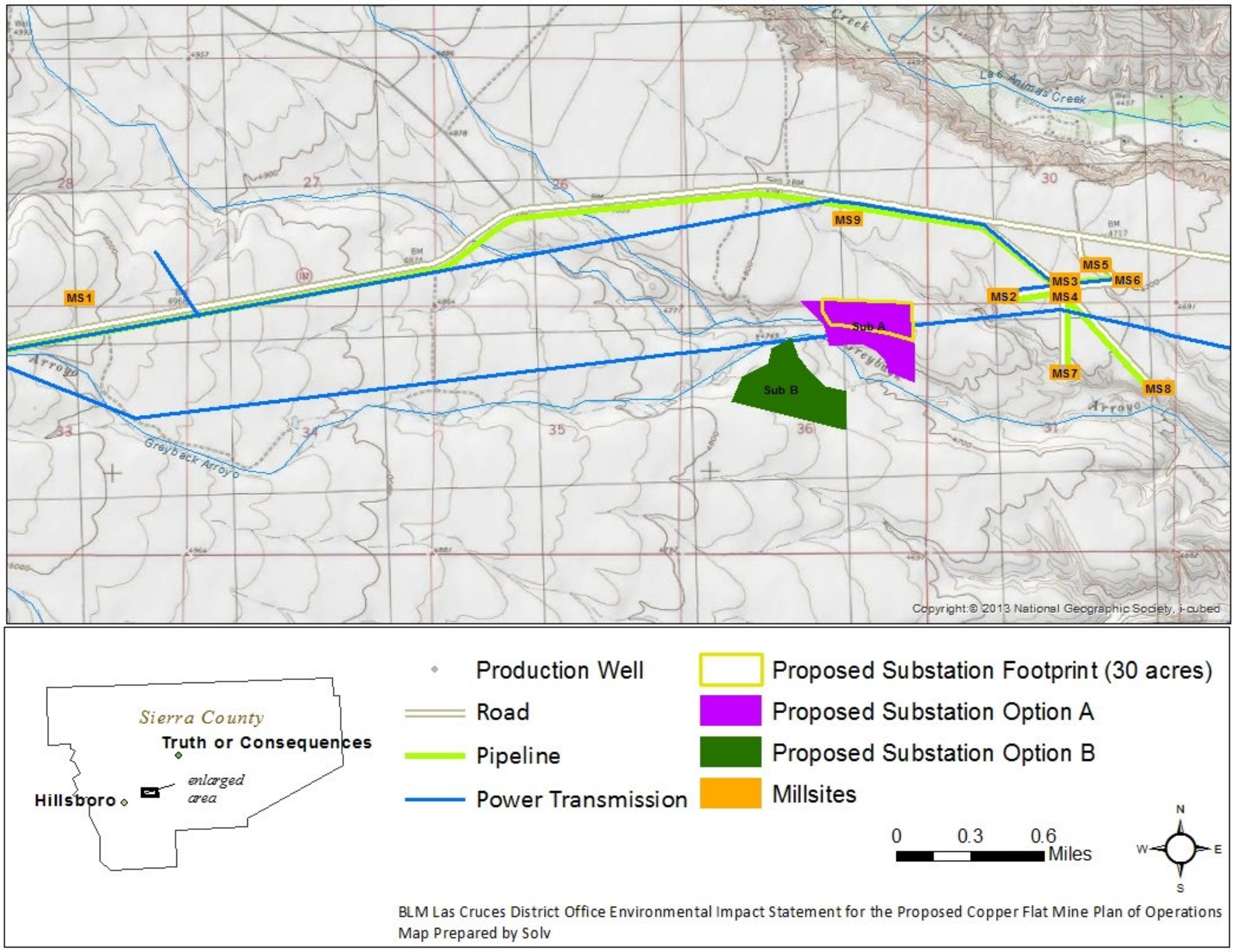
Pit: The pit makes up 21 acres (or 1 percent) of the proposed mine area. The most common ground surface in this location is crushed, cobble-sized rock. During mine area surveys (THEMAC 2011), plant cover was very low, with no annual plants encountered due to past disturbance from mine activity and subsequent loss of soil. A portion of this area is covered with perennial grasses; the three most common grasses encountered during mine area surveys were Harvard's three-awn, silver bluestem (*Bothriochloa laguroides*), and side oats grama. Other vegetation found in this area includes forbs and shrubs. The most common shrub found was California brickelbush (*Brickellia californica*) (THEMAC 2011).

Tailings Dam: The tailing dam area accounts for 16.6 acres (or 0.76 percent) of the proposed mine area. Based on current vegetation distribution and diversity, it is likely that this area was seeded during previous reclamation efforts (though gravel is the most prominent ground cover). During mine area surveys, perennial plants were the most abundant type of vegetation found in the tailing dam area. Of these, silver bluestem was the most abundant. Honey mesquite, broom snakeweed, and feather dalea (*Dalea formosa*) were the most abundant shrubs encountered (THEMAC 2011).

Disturbed Areas/Waste Rock Piles: Disturbed areas/waste rock piles account for 865.7 acres (or 39.5 percent) of the proposed mine area. The vegetation community found within the disturbed areas/waste rock piles is the most variable due to previous mining activities and associated reclamation efforts. Scraped areas, mining waste dumps, waste rock piles, and placer mining overburden are scattered throughout this land cover. Grasses, particularly graminoids, are the most common vegetation type found in the disturbed areas/waste rock piles. The most dominant species are side oats grama, cane bluestem, black grama, and fluff grass. Shrubs found in this area include honey mesquite, broom snakeweed, and feather dalea. The most dominant perennial forb in this area is spreading buckwheat. Annual plant species include sixweeks grama, threadstem chinchweed, and tansy aster (*Machaeranthera tanacetifolia*). Besides vegetation, the groundcover in this area consists of bare soil, litter and gravel, and rock and bedrock (THEMAC 2011).

Millsites and Substation Site: Millsite and substation locations (see Figure 3-27) were the subjects of a spring 2015 biological survey that yielded 123 plant species, most of which were native. No special status plant species, wetlands, springs/seeps, noxious weeds, adits/shafts, or other biological features critically unique to the region were observed. The majority of the proposed millsites are located in areas with existing developments, such as production wells or monitoring wells, and each of the sites is bisected by a road. Five typical vegetation types were described for the broad millsite and substation survey area: creosotebush shrubland, draw vegetation, arroyo vegetation, grassland flat, and tobosa grass (*Pleuraphis mutica*) swale.

Figure 3-27. Millsite and Substation Survey Areas



Source: NMCC 2015d.

- **Creosotebush shrubland:** Most of the site is dominated by creosotebush flats. In addition to creosotebush, other shrubs regularly observed included tarbush, mariola (*Parthenium incanum*), Christmas cactus (*Cylindropuntia leptocaulis*), purple prickly pear (*Opuntia macrocentra*), honey mesquite, and longleaf jointfir (*Ephedra trifurca*). Common forbs in this type include snakeweed, dwarf desertpeony (*Acourtia nana*), desert marigold (*Baileya multiradiata*), spreading fleabane (*Erigeron divergens*), Indian rushpea (*Hoffmannseggia glauca*), Coulter's horseweed (*Laennecia coulteri*), bristly nama (Nama hispidum), fiveneedle prickly leaf (*Thymophylla pentachaeta*), and skyblue phacelia (*Phacelia caerulea*). Bush muhly, burrograss (*Scleropogon brevifolius*), and low woollygrass (*Dasyochloa pulchella*) are the most common grasses. This type was the most dominant community through all of the millsites and in substation A. The southern portion of substation B is composed of creosote hills that transition into a creosote flat on the southernmost edge of the site.
- **Arroyo vegetation:** The bottom of Greyback Arroyo is dominated by honey mesquite, singlewhorl burrobrush (*Ambrosia monogyra*), and Apache plume. Tall shrubs and trees such as littleleaf sumac (*Rhus microphylla*), Netleaf hackberry (*Celtis reticulata*), whitethorn acacia (*Acacia constricta*), and desert willow are also present; primarily in the arroyo bottom or in the confluence of the arroyo bottom with the draws. The trees and taller shrubs appear

to diversify the habitat at the site because they add significant vertical structure. Common forbs and grasses include side-oats grama (*Bouteloua curtipendula*), low woolly grass, rose heath (*Chaetopappa ericoides*), and absinth leaf bahia (*Bahia absinthifolia*). This type only intersects two small corners of Substation A. The arroyo vegetation type is entirely avoided in the substation B site and the millsites.

- **Draws:** Side slopes of the draws that feed into Greyback Arroyo are dominated by honey mesquite and tobosa grass. Other species often found on draw slopes include side-oats grama, feather dalea, and longleaf jointfir. The draw bottoms contain similar species as the arroyo vegetation type but individuals are typically shorter statured and littlefeaf sumac and catclaw mimosa are more prominent than in the arroyo type. The draw vegetation type intersects portions of substation A, substation B, and millsites 7 and 8.
- **Grassland flat:** The northern half of substation B contains a large area dominated by annual grasses, tobosa grass, halfmoon milkvetch (*Astragalus allochrous*), and honey mesquite. Annual grasses, primarily six-weeks grama, compose most of the plant cover in this type.
- **Tobosa grass swale:** A tobosa grass swale has developed in a narrow zone where finer textured soils have accumulated over the gravelly loams that are more characteristic of the mine area. This vegetation type crosses through mill site 5 (MS5) and the small depression eventually drains into a draw vegetation type. Honey mesquite is the most common woody plant in this type.

The affected habitats are primarily Chihuahuan desert scrubland with a plant community that has deviated from its ecological potential (as described in the ecological site report for Gravelly). However, perhaps unintentionally, small portions of the millsite boundaries include draws and arroyo habitats that contain relatively unique microhabitats for the area. As indicated by the survey, the arroyo habitats and draws contain a higher biological diversity and abundance than the surrounding creosote flats. Avoiding disturbance in draws or in the arroyo during future developments in this area would be mitigative.

Wetlands: During mine area surveys (Intera 2012), two locations within the proposed mine area boundary appeared to meet wetland conditions as defined by the Clean Water Act (i.e., dominance by hydrophytic vegetation, hydric soils, and wetland hydrology); however, formal wetland delineations were not conducted. One of these areas is a small cattail wetland adjacent to the pit lake (see description above under Arroyo Riparian). The second wetland area, a patch dominated by Goodding's willow and estimated to be 1.5 acres, is located within the mine in the bottom of Greyback Arroyo just below the culvert where the pit access road crosses Greyback Arroyo. Seep willow (*Baccharis salicifolia*) also occurs here.

Pipeline Corridor and NM-152: Much of the area proposed for the pipeline corridor consists of existing roads, associated rights-of-way, a power utility corridor, and well sites. Within this corridor, 67 plant species were observed during surveys. The dominant species observed were creosote bush, woollygrass (*Dasyochloa pulchella*), weeping lovegrass (*Eragrostis curvula*), spreading buckwheat, tarbush, broom snakeweed, tobosa grass, and honey mesquite (THEMAC 2011).

Las Animas Creek: Las Animas Creek, located in the Caballo Lake watershed approximately 4 miles north of the proposed mine boundary, contains variable stream flow, including ephemeral, intermittent, and perennial reaches along approximately 40 total river miles. The Las Animas Creek vegetation study area for this EIS fell entirely on private land. Ladder Ranch did not grant access permission for this study; as a result, the study area for Las Animas Creek includes the riparian habitats along approximately 7 river miles of the creek from the eastern Ladder Ranch boundary to I-25.

Riparian habitat along Las Animas Creek is extensive alongside the upper and middle reaches of the Creek. Here the surficial geology consists of bedrock with inter-bedded clays that retard downward flow of surface waters, thereby sustaining a perched surface aquifer in the Creek alluvium. This perched water table supports substantial riparian tree growth, including an ecologically important stand of Arizona sycamores (*Plantanus wrightii*) with cottonwoods, netleaf hackberry, velvet ash, Goodding's willow, and coyote willow (*Salix exigua*). Understory vegetation along the creek consists of burro bush and baccharis communities (THEMAC 2011). The Arizona sycamore is an important bird tree in this area, providing habitat for many species including woodpeckers and owls (Firefly Forest 2015). This tree can only be found along riparian corridors (NPS 2012) and is the most abundant co-dominant species along Las Animas Creek. Although habitat for the Arizona sycamore has been disturbed in this area, the population appears to be in good condition (THEMAC 2011). In the lower reach of Las Animas Creek, where the surficial geology does not have the shallow inter-bedded clays that would support a perched aquifer and the artesian well system does not contribute directly to creek flows, there is no riparian vegetation growth of any note. There are some minor patches of wetland emergent vegetation in the artesian-well fed ponds.

Percha Creek: Percha Creek lies approximately two miles south of the proposed mining boundary. Like Las Animas Creek, it has ephemeral, intermittent, and perennial sections. Percha Creek lies in the Caballo Lake watershed and enters Caballo Lake on the south end of the reservoir. The reach surveyed for the vegetation study also includes Percha Box, a steep-walled canyon with perennial flows. The Percha Creek study area includes the riparian habitats along approximately 15 river miles from Hillsboro, New Mexico to just above I- 25. Most of the study area was on private land with the exception of the Percha Box reach and a small section of State Trust land. Percha Box is carved through a portion of BLM property.

Riparian and arroyo riparian vegetation communities along Percha Creek included burro bush, Apache plume, baccharis, cottonwood, Goodding's willow, coyote willow, netleaf hackberry, little walnut, velvet ash, desert willow (*Chilopsis linearis*), honey mesquite, cat-claw acacia (*Acacia greggii*), whitethorn acacia, and cat-claw mimosa. Streamside patches of cattail were also observed along the Percha Box (Intera 2012).

Invasive Species: *Executive Order 13112 - Invasive Species* directs Federal agencies to make efforts to prevent the introduction and spread of invasive plant species, detect and monitor invasive species, and provide for the restoration of native species. Invasive species are usually destructive, difficult to control or eradicate, and generally cause ecological and economic harm. A noxious weed is any plant designated by a Federal, State, or county government as injurious to public health, agriculture, recreation, wildlife, or property. Noxious weeds in New Mexico can be found on rangeland and wild land. The Noxious Weeds Management Act directs the New Mexico Department of Agriculture (NMDA) to develop a noxious weed list, identify methods of controlling designated species, and educate the public about noxious weeds. It is also the role of the NMDA to coordinate weed management among local, State, and Federal managers (NMDA 2012).

During the 2010 and 2011 mine area surveys of the proposed mine area, saltcedar (*Tamarix chinensis*) was the State-listed noxious weed encountered with some frequency within the proposed mine boundary (THEMAC 2011). The total area of saltcedar patches mapped in the mine area was approximately 30 acres. This shrub or shrub-like tree has numerous large branches and scale-like leaves. Its deep, extensive root system extends to the water table and can extract water from unsaturated soil layers. Saltcedar has spread throughout the southwestern United States, including New Mexico, where it is especially pervasive. It occurs in every major watershed in New Mexico and in a variety of community types, especially those dominated by cottonwood and willow. It is found in floodplains, arroyos, alkali sinks, and playas. This species out-competes native species as it is more drought-tolerant and less palatable to grazing animals than native species. Saltcedar is usually associated with changes in geomorphology, hydrology, soil salinity, fire regimes, plant community composition, and native wildlife density and diversity (Zouhar 2003).

Tree of heaven (*Ailanthus altissima*) and Siberian elm (*Ulmus pumila*) were both observed as single individuals growing at the base of the tailing dam. Both of these infestations were isolated and minimal, only one pole-sized Siberian elm tree was observed, as was a small patch of Tree of heaven, likely composed of one individual connected with rhizomes belowground.

Three state listed noxious weeds were observed in the Las Animas Creek study area including; Siberian elm, saltcedar, and tree of heaven. Two State-listed noxious weed species were classified as co-dominants in the Percha Creek study area (THEMAC 2011). Tree of heaven and Siberian elm were each encountered.

Restoration: In 2005, the BLM in New Mexico launched the Restore New Mexico initiative with the goal of restoring grassland, woodland, and riparian areas to a healthy and productive condition. To date, it has applied restoration treatments on over 3 million acres, including public, State, and private lands. What began as a concept has become a widely successful restoration and reclamation program involving numerous agencies, organizations, ranchers, and industry groups. Landscape restoration in New Mexico has focused on controlling invasive brush species, improving riparian habitat, reducing woodland encroachment, and reclaiming abandoned oil and gas well pads (BLM 2014).

As part of Restore New Mexico, the Copper Flat Allotment No. 16079 completed a grassland restoration treatment of approximately 5,546 acres, targeting creosote bush (*Larrea tridentata*), in November 2014 (Gentry 2014). Although this treatment is entirely outside of the proposed mine area, it gives a vested interest in the allotment from a vegetation/watershed restoration standpoint. The long-term result of the treatment will be to reduce existing invasive species, with the objective of increasing more desirable herbaceous vegetation. This, in turn, will benefit the watershed by stabilizing soil and ultimately increase forb, grass and favorable shrub production, resulting in increased and improved habitat for a variety of wildlife.

3.11.2 Environmental Effects

3.11.2.1 Proposed Action

Medium-term and long-term minor to moderate adverse effects to primarily upland vegetation would be expected under the Proposed Action. Impacts would be of medium extent (localized) and the likelihood of impacts is probable. Medium-term effects would be due to vegetation disturbance in the course of surface activities; however, ongoing reclamation activities would allow most of this vegetation to recover. Longer-term effects would occur due to vegetation removal for the duration of the project. Impacts on wetland and riparian vegetation communities caused by deep groundwater drawdown would either not occur or would be negligible because of the minimal effect that drawdown in the deep aquifer would have on surface water or the shallow alluvial aquifers.

3.11.2.1.1 Mine Development and Operation

Mine development activities that would affect vegetation include clearing and grading activities associated with construction, operation, and maintenance. Both woody and herbaceous (non-woody) vegetation would be cleared and grubbed in constructing haul and secondary mine roads as well as mining facilities, essentially eliminating that vegetation for the approximately 16-year duration of the Copper Flat project. Approximately 1,586 acres of vegetation on both public and private lands would be directly affected. While 910 acres of the proposed mine area boundary have previously been disturbed from past mining activities, the proposed mining activities would also impact 676 acres of undisturbed land within this boundary. Outside the mine area boundary, up to 45 acres would be permanently cleared of vegetation for millsite construction activities at the millsite locations.

The type of plant communities that could be impacted are discussed previously within this resource section. These ecological sites are common to the Chihuahuan Desert of southern New Mexico. Under the Proposed Action, all of the natural plant communities would be disturbed but the degree of disturbance would vary (i.e., direct impacts due to mining activity vs. indirect impacts caused by water drawdown). To minimize the area disturbed, reclamation would be conducted concurrently with mining operations where feasible. The grassy hills, shrublands, and arroyo/riparian would be directly impacted to some extent within the permit boundary. Disturbed vegetation within the boundaries of past mining activities would also be impacted.

Medium-term, minor, adverse effects to vegetation within and surrounding the proposed mine area boundary and proposed pipeline corridor, as well as vegetation along NM-152 would also be expected from soil compaction and erosion, dust pollution, accidental spills, and the potential influx of invasive species. Similar types and levels of impacts would occur to vegetation outside the construction footprint at the millsite locations.

Construction and operation of the proposed mine would result in soil compaction of the proposed mine site and surrounding area. Excessive soil compaction impedes root growth and limits the amount of soil available for roots, decreasing a plant's ability to take up nutrients and water. Soil compaction also increases water runoff and soil erosion. Surface water runoff and sediment from areas disturbed by construction could adversely affect local vegetation by exposing soils and transporting sediment off-site (UMN 2011). Though the proposed mine could result in an increase in soil compaction, erosion, and water runoff, the proposed site has already experienced soil compaction from past mining activities. The National Pollutant Discharge Elimination System (NPDES) Stormwater Program requires that all construction projects that exceed 1 acre of disturbance develop SWPPPs and erosion and sedimentation control plans which minimize the potential for contamination of surface or groundwater resources (USEPA 2011). This plan, along with proposed BMPs, would help control erosion on the reservoir site. Soil impacts are discussed further in Section 3.8, Soils.

During construction and operation of the mine, adverse effects to local off-site vegetation may occur as a result of fugitive dust emissions from construction machinery and worker traffic along unpaved roads. Dust emission could reduce photosynthesis by reducing the amount of light penetrating through the leaves. Dust emissions could also increase the growth of plant fungal disease (NZME 2001). Dust from construction-related activities would be short-term, and after construction, local off-site vegetation would be expected to recover in a reasonable amount of time.

Invasive plant species can quickly colonize areas with disturbed soil conditions. Surface disturbance and construction activities could facilitate the establishment and spread of invasive plant species and noxious weeds. Aggressive non-native species could become established if ground disturbance during construction is extensive and long in duration. Construction equipment could aid in the introduction of invasive species by transporting an invasive species from one area to another; however, the BLM has strict weed control stipulations regarding project work and disturbance. All equipment must be pressure washed before being moved on-site; thus there should be no introduction of noxious weeds as a result. Additionally, given the procedures outlined in the project's reclamation plan (described in Section 2.1.15), the risk for problematic infestations of invasive plant species would be substantially reduced. However, even taking a comprehensive array of diligent precautions, the potential for noxious weeds to become established would remain a substantive threat.

Possible spills of fuels and other material could cause shifts in population structure, abundance, diversity, and distribution of plant species. Depending on the type of material spilled, some materials could remain in the environment long after a spill event (USFWS 2004). Possible spills during construction of the proposed mine would be expected to be small and would be quickly contained.
Impacts on the small cattail wetland adjacent to the pit lake would be long-term and moderate since pumping of the pit lake would be necessary prior to mining and continuously throughout the life of the mine with bedrock water drawdown in this area greater than 100 feet. (See Figure 3-13.) This small wetland would be mined out when the pit is mined and deepened to 900' below the current surface. The second wetland area, which contains Goodding's willow near the main mine entrance, would not be affected by drawdown associated with the Proposed Action because it would be outside of the drawdown area. (See Figure 3-13.) This area overlies the andesite bedrock of the Animas Uplift. As a result, there is no aquifer underlying the surface. Vegetation in the area does not rely on discharge from a shallow aquifer, but on runoff in Greyback Arroyo that feeds the shallow subsurface (Emmer 2015).

Estimates of the change in creek hydrology from mining drawdown in the deep aquifer are listed in Table 3-29.

Table 3-29. Effects of Groundwater Drawdown on Creeks*

Table 3-29. Effects of Groundwater Drawdown on Creeks*		
	Las Animas Creek	**Percha Creek**
Change in flow and ET rate 3 months after mining (AFY)	12	18
Change in flow and ET rate 100 years after mining (AFY)	1	3
Baseline flow and ET	4,848	2,630

Source: NMCC 2015.

Note: *Depth of riparian vegetation root zone for purposes of estimating effects of changes in ET is 15 ft. All flow and ET is considered ET. Zero surface flow assumed at outlets.

There would be no effects to riparian vegetation at Percha Creek as no water drawdown is expected where riparian vegetation occurs. The downstream end of Percha Creek, where drawdown of groundwater in the shallow alluvium could be 0.5 to 1.5 feet by the end of mining, is dominated by burro bush and honey mesquite, both upland species. Groundwater drawdown that could affect the shallow alluvium of Percha Creek would not occur in any area of the creek that supports riparian vegetation.

> Estimated depth of shallow aquifer drawdown in Las Animas Creek was computed as follows:
>
> 12 AFY/4848 AFY x 15 ft (180 in) ET depth = 0.45 in

Perched alluvial groundwater under the middle reach of Las Animas Creek (see Figure 3-10, Zone 2) has extremely limited hydraulic connection to the deep aquifer that would be directly impacted by pumping of the supply wells. Instead, the hydrology within the perched layer reflects localized flow conditions, such as seepage from irrigation canals and irrigated fields and pumping of small capacity private wells. An estimate based on the groundwater modeling predicts that direct drawdown in the shallow alluvium underlying Zone 2 of Las Animas Creek would likely be less than 1 inch (see text box) after mining ceases. (See Table 3-29.) Because the groundwater drawdown of the shallow alluvium in the upper and middle reaches (12 AFY) would be so small relative to the ET of the vegetation (4,848 AFY), there would likely be no change or an imperceptibly small change to the vigor and composition of the existing riparian tree community adjacent to Las Animas Creek. Although the streamflow effect of reduced recharge was not an explicitly modeled part of the hydrologic modeling, it is highly unlikely that drawdown in the deep aquifer would cause any measurable reductions in streamflow, spatially or temporally, that would impact shallow-rooted plants and seedling establishment in and along the creek in Zone 2.

In the lower reach of Las Animas (Zone 3), as noted in the groundwater analysis described in more detail in Section 3.6, ancillary calculations and site inspection have indicated that water from the artesian wells does not create surface creek flows in the lower reach, but is consumed in pond and irrigation ET and subsurface alluvial recharge, which eventually flows into Caballo Reservoir. This is because the artesian wells have been employed for crop irrigation purposes by landowners along the lower reach where the well water is retained in a number of irrigation ponds or otherwise seeps back into the subsurface alluvial flows to Caballo Reservoir. Because artesian water is captured to such a great extent in this system, surface creek flows occur only immediately after substantive rainfall events.

3.11.2.1.2 Mine Closure/Reclamation

Upon closure of the mine, final reclamation would be conducted to restore original vegetation communities to disturbed areas. Revegetation activities would be done in accordance with the project's reclamation plan as outlined in Section 2.1.15. These procedures would also involve annual monitoring and appropriate modifications of revegetation guidelines in accordance with site-specific findings to maximize the potential for revegetation success. It is anticipated that reclamation efforts would be able to achieve a stable, perennial vegetation cover that would: 1) protect disturbed soils from erosion, and 2) provide suitable forage for livestock and wildlife habitat.

Reclamation activities would include revegetating disturbed areas with a diverse mixture of appropriate plant species in order to achieve a self-sustaining ecosystem or other approved post-mining land use. The proposed mine would result in the conversion of tree- and shrub-dominated vegetation types in the mine area to grass/forb-dominated vegetation types immediately following reclamation. Over the long-term, shrubs and trees would become reestablished and increase in abundance within the majority of disturbed areas as a result of reclamation and natural recolonization.

After pit lake pumping activities end, a lake is expected to reform as recharge refills the local cone of depression developed from pit lake pumping. Although it is not likely that the small cattail wetland currently adjacent to the pit lake would re-establish in the same exact location, it is possible that new wetlands would form in the area with riparian and water-loving plant species (willows, cottonwood, cattails, sedges, etc.), which may be introduced in shallow areas near the shoreline of the pit lake.

3.11.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Implementation of Alternative 1 would result in the disturbance or loss of up to 1,401 acres of vegetation over the life of the mine. As in the Proposed Action, up to 45 acres would be permanently cleared of vegetation for millsite construction activities at the nine millsite locations.

Direct effects on vegetation resources would be similar to those described under the Proposed Action and include medium-term and long-term loss of vegetation associated with construction, operation, and maintenance of the Copper Flat project, degradation of vegetation due to trampling, soil compaction, spills, increased access, introduction of invasive and nonnative species, and loss of wetland and riparian vegetation. Mine closure and reclamation effects would also be similar to those described under the Proposed Action.

Indirect effects could occur as a result of water table decline. Effects on wetlands would be the same as under the Proposed Action with the small wetland adjacent to the pit lake being mined out and no effect on the wetland area which contains Goodding's willow near the main mine entrance. (See Figure 3-16.)

No or minimal adverse effects to riparian and aquatic vegetation along Las Animas Creek from water table drawdown would occur. There would be no effects to riparian vegetation at Percha Creek as no water drawdown is expected where riparian vegetation occurs.
Medium-term and long-term minor to moderate adverse effects to vegetation would be expected under Alternative 1.

3.11.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Implementation of Alternative 2 would result in the disturbance or loss of up to 1,444 acres of vegetation over the life of the mine. As in the Proposed Action, up to 45 acres would be permanently cleared of vegetation for millsite construction activities at the nine millsite locations and, under this alternative, as much as 30 additional acres would be cleared for substation construction.

Direct effects on vegetation resources would be similar to those described under the Proposed Action and include medium-term and long-term loss of vegetation associated with construction, operation, and maintenance of the Copper Flat project, degradation of vegetation due to trampling, soil compaction, spills, increased access, and introduction of noxious weeds and invasive and nonnative species, and loss of wetland vegetation. Mine closure and reclamation effects would also be similar to those described under the Proposed Action.

Indirect effects could occur as a result of water table decline. Effects on wetlands would be the same as under the Proposed Action with the small wetland adjacent to the pit lake being mined out and no effect on the wetland area which contains Goodding's willow near the main mine entrance. (See Figure 3-19.)

There would be no or minimal effects to riparian vegetation at Las Animas Creek or Percha Creek.

Medium-term and long-term, minor to moderate adverse effects to vegetation would be expected under Alternative 2. Impacts of Alternative 2 on vegetation would be significant.

3.11.2.4 No Action Alternative

Under the No Action Alternative, there would be no disturbance of the site's vegetation communities from clearing, grubbing, grading, and other project-related activities at the mine site. No additional vegetation and habitat would be disturbed or removed, and the existing vegetation communities described above would be expected to continue indefinitely. Natural and unnatural disturbances may occur in the area, as they have in the past, but overall, the communities now present would be expected to remain. Beyond that, the effects of climate change may alter the vegetation composition and structure of the mine area, with some species and communities increasing in abundance while others decreasing.

3.11.3 Mitigation Measures

To prevent the introduction and minimize the spread of nonnative vegetation and noxious weeds, mitigation measures would be implemented during project activities, including:

- On-site biological monitoring in areas of noxious weed concern or presence would be conducted before, during, and after project activities. NMCC would be responsible for providing the monitoring.
- Vehicle and equipment parking would be limited to within construction limits or approved staging areas.
- Heavy equipment would be cleaned and weed-free before entering a mine area.

- Monitoring and follow-up treatment of exotic vegetation would occur after project activities are completed.
- All gravel and fill material imported on-site must be source-identified to ensure that the originating site is noxious weed free.
- During the reclamation phase of the project, all areas disturbed by construction would be reseeded with a BLM-approved seed mix.

3.12 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

3.12.1 Affected Environment

Certain wildlife and plant species are provided special Federal protections under the Endangered Species Act (ESA) (16 U.S.C. 1531 *et seq*.) because of extremely low or declining populations from natural factors, loss of habitat or critical habitat features, and inadequate conservation measures. A species is listed as endangered if it is determined to be in danger of extinction throughout all or a significant portion of its range, or is listed as threatened if it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Although endangered species are more imperiled, both endangered and threatened species are provided the same level of protection under the law. Special status species include those listed or proposed for listing under the ESA, and BLM-designated sensitive species. Sensitive species are those requiring special management considerations to promote their conservation and reduce the likelihood and need for future listing under the ESA, and include Federal candidate species and delisted species in the 5 years following delisting (BLM 2008).

There are numerous terrestrial and aquatic wildlife species and plants designated as special status species within Sierra County. As described in Section 3.10, Wildlife and Migratory Birds and Section 3.11, Vegetation, Invasive Species, and Wetlands, NMCC's biological resources contractor completed a biological study of the project site (the proposed mine site, pipeline/NM-152 corridor, and Las Animas Creek and Percha Creek riparian areas) to identify the presence of special status species (both wildlife and plants) and to evaluate the potential for and presence of habitat for special status species. The study consisted of searches of online databases, published books, and reports; communications with local experts to determine the potential occurrence and habitat needs of special status species in Sierra County; and limited, non-protocol field mine area surveys. Table 3-30 lists those special status species that were either observed or recorded in the vicinity of the project site or for which potential habitat was found to be present in the mine area.

One State-listed sensitive species, the loggerhead shrike (*Lanis ludovicianus*), was detected during the millsite and substation survey (NMCC 2015). Potential habitat may be present in the mine area for 17 species described as sensitive or threatened by the State. Four of these species are also considered species of concern by the USFWS. The millsite and substation areas do not support potential habitat for any Federally-listed threatened or endangered species. Several sensitive bat species were detected in the Copper Flat mine area during BDR surveys and it is likely that those same species would be detected in the millsite and substation areas (particularly near the livestock watering tank identified in the survey as MS-9); however, a formal bat survey would be required to confirm that.

Table 3-31 lists other threatened or endangered wildlife and plant species identified by the USFWS that may occur in Sierra County in the vicinity of the project site (USFWS 2015). These species were either included in the mine area biological survey and neither the species nor its habitat were discovered, or the species were excluded from the biological survey because of lack of specific habitat features or requirements.

Table 3-30. Special Status Species Observed or with Potential Habitat in Mine, Millsite, or Substation Areas

Table 3-30 Special Status Species Observed or with Potential Habitat in Mine, Millsite, or Substation Areas						
		Status[1]				
Common Name	**Scientific Name**	**Federal**	**State**	**BLM**	**Species Observed/ Recorded[2]**	**Potential Habitat[2]**
Reptiles and Amphibians						
Chiricahua Leopard Frog	*Lithobates chiricahuensis*	T				3
Southwestern (Arizona) Toad	*Anaxyrus (Bufo) microscaphus*		S	S		3
Birds						
Common Black Hawk	*Buteogallus anthracinus*		T		3	3
Yellow-billed Cuckoo[3]	*Coccyzus americanus*	T	S	S	3	3
Bald Eagle	*Haliaeetus leucocephalus*		T	S	3	
Northern Aplomado Falcon	*Falco femoralis septent.*	NEP	E			1, 2, 3
Peregrine Falcon	*Falco peregrinus anatum*		T			1, 2
Arctic Peregrine Falcon	*Falco peregrinus tundrius*		T			1
Mexican Spotted Owl	*Strix occidentalis lucida*	T	S		3	
Loggerhead Shrike[4]	*Lanius ludovicianus excub.*		S		1, 3	1, 2, 3
Baird's Sparrow	*Ammodramus bairdii*		T	S	3	1, 2
Sprague's Pipit	*Anthus spragueii*	C		S		2
Bell's Vireo	*Vireo bellii arizonae*		T	S		3
Gray Vireo	*Vireo vicinior*		T			1
Western Burrowing Owl	*Athena cunicularia*			S		2
Mammals						
Allen's Lappet-brown Bat	*Idionycteris phyllotis*			S		1, 2, 3
Townsend's Big-eared Bat	*Corynorhinus townsendii*			S	1, 3	1, 2, 3
Fringed Myotis Bat	*Myotis thysanodes thysanodes*		S		1, 2, 3	1, 2, 3
Yuma Myotis Bat	*Myotis yumanensis yuman.*		S		1, 2, 3	1, 2, 3
Desert Pocket Gopher	*Geomys arenarius brevirostris*		S			1
Ringtail	*Bassariscus astutus*		S			2
Common Hog-nosed Skunk	*Conepatus leuconotus mearnsi*		S			1, 3
Western Spotted Skunk	*Spilogale gracilis*		S			1, 3
Plants						
Duncan's Pincushion Cactus	*Escobaria duncanii*		E	S		1, 2
Sandberg Pincushion Cactus	*Escobaria sandbergii*		S			1, 2
Thurber's Campion	*Silene thurberi*		S			1

Source: Intera 2012, BLM 2013, BLM 2011, USFWS 2015

Notes: [1] T = threatened E = endangered C = candidate S = sensitive NEP = nonessential experimental population.

[2] 1 = mine site 2 = pipeline corridor 3 = Las Animas/Percha Creeks riparian areas.

[3] Western distinct population segment (DPS).

[4] Species detected in mine area, millsite, and substation surveys.

Table 3-31. Federally-listed Species Not Observed or with No Potential Habitat in Mine Area

Common Name	Scientific Name	Status[1]	Habitat
Reptiles and Amphibians			
Narrow-headed Garter Snake	*Thamnophis rufipunctatus*	T	Species strongly associated with clear, rocky streams using predominantly pool and riffle habitat that includes cobbles and boulders; species range in New Mexico is Gila River to Arizona border. Habitat is not in mine area.
Birds			
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E	Species not detected during surveys of mine area; dense riparian habitat required for nesting not present in mine area; migratory habitat is along Rio Grande River, which is outside mine area; available data for Las Animas and Percha creeks riparian areas do not indicate historic or current presence of species.
Mammals			
Mexican Wolf	*Canis lupus baileyi*	E	Species inhabits evergreen pine-oak woodlands, pinyon–juniper woodlands, and mixed-conifer montane forests that are inhabited by preferred prey of elk, mule deer, and white-tailed deer. Mine area is not preferred habitat, and species not observed during surveys of mine area.
Fishes			
Gila Trout	*Oncorhynchus gilae*	T	Habitat restricted to a few isolated streams in the upper Gila River and San Francisco River drainages, which are outside mine area.
Rio Grande Silvery Minnow	*Hybognathus amarus*	E	Known to occur only in reach of Rio Grande from Cochiti Dam to headwaters of Elephant Butte Reservoir; which is outside the mine area.
Plants			
Todsen's Pennyroyal	*Hedeoma todsenii*	E	Plant grows in gypseous-limestone soils on north-facing slopes in piñon-juniper woodland; this type of habitat is not in mine area.

Source: USFWS 2015, FR 2015, Intera 2012.

Note: [1] T = threatened E = endangered.

3.12.2 Environmental Effects

3.12.2.1 Proposed Action

The Proposed Action would not affect certain Federally-listed, proposed for listing, or candidate species that may occur in Sierra County, including Sprague's pipit and northern aplomado falcon, as discussed below, and would not affect the other species listed in Table 3-31.

Because the Mexican spotted owl, western yellow-billed cuckoo, and Chiricahua leopard frog have been observed or recorded near the mine area, the impacts of the Proposed Action may affect these species. The likelihood and severity of possible effects are being evaluated and any measures necessary to mitigate adverse effects are being determined in consultation with the USFWS in compliance with Section 7 requirements of the Endangered Species Act.

The Proposed Action would have possible adverse impacts of long-term duration with minor magnitude on special status species that are not Federally-listed and that have been observed in the project site, or that could occur because potential habitat exists in the project site. Impacts to these non-Federally-listed special status species would be of small (limited) extent.

3.12.2.1.1 Mine Development and Operation

Mine development and operation activities would impact a total of 1,586 acres (see Table 2-1) on both public and private lands within the proposed mine area boundary, of which approximately 57 percent has been previously disturbed from past mining activities. The remainder would be new surface disturbance (Intera 2012). As described in Section 3.11, Vegetation, Invasive Species, and Wetlands, the terrestrial plant communities that would be impacted by new surface disturbance within the mine boundary and through the pipeline/NM-152 corridor for utility and infrastructure support are not considered unique but represent some of the more common vegetation types in New Mexico. Effects to riparian habitats, which are not widespread or common but occur only along water courses in New Mexico, would be minor and only a small amount of wetland habitat adjacent to the pit lake would be affected.

State and BLM- Listed Special Status Species: The mine development activities could directly result in displacement of or mortality to any New Mexico-listed or BLM-listed special status species inhabiting the project site where potential habitat exists. Mobile species would likely avoid injury or mortality by leaving the area; however, less mobile or burrowing species might be more susceptible to injury or mortality from mine development activities. Removing 676 acres of Chihuahuan Desert grassland and shrubland would impact any special status species inhabiting or using the project site; however, this type of habitat is the most common throughout the surrounding area, and no unusual plant communities necessary for special status species survival would be disturbed. Thus, removal of this common habitat type would not impact the special status terrestrial and avian species listed in Table 3-30 that could be present in the project site. Should nests be removed as described below in Section 3.12.3, migratory birds that have a fidelity to past nesting areas could be affected during the following nesting season.

Special status bat species were recorded within the project site. The remnant mine pit lake provides feeding habitat, and the crevices in the rocky hills and the abandoned mine shafts within the mine area boundary provide roosting habitat (Intera 2012). Mining operations would change the function and use of the remnant lake, which would probably affect the presence and amount of insects that serve as a food source for bats. However, lighting for nighttime mining operations could become a new attractant for insects. Shafts or adits that would be closed or re-opened for mining would eliminate potential roosting habitat for bats, but these effects would be minimized with the mitigation measures described in Section 3.12.3. Noise from mining operations and increased human presence could also deter bats from using or returning to available roosting habitat.

Although general habitat requirements were present or marginally present in the project site for the special status plant species listed in Table 3-30, no plants were observed and none are expected to occur (Intera 2012). The only known New Mexico population of Duncan’s pincushion cactus is more than 4 miles northeast of the project site (Intera 2012).

Federally-Listed Species the Project Would Not Affect: Although these species may occur in the general mine area and certain habitat requirements are met in the mine area, the Proposed Action would have no effect on the Northern Aplomado falcon or Sprague’s Pipit.

- Northern Aplomado Falcon: The northern aplomado falcon that could occur in Sierra County is a nonessential experimental population, which is defined as a species proposed for Federal listing under Section 10(j) of the ESA. Suitable habitat for the falcon includes desert grasslands with scattered mesquite and yucca, and riparian woodlands in open grasslands, with minimal disturbance from agricultural and grazing practices. The Chihuahuan Desert grassland and shrubland habitats that exist in the project site have been affected by grazing practices and lack some of the yucca/grassland habitat preferred by the falcon. Falcon releases have occurred in Sierra County along with grassland restoration projects in the vicinity, but these releases have not resulted in known aplomado falcon nests in the county (BLM 2013). Although mine development and operation would remove grassland and shrubland vegetation, that type of vegetation is common to the area and would therefore have no effect on the falcon or its preferred habitat.
- Sprague's Pipit: Sprague's pipit occurs sporadically in winter in southern Chihuahuan Desert grasslands, primarily in the lower Pecos River Valley, Otero Mesa, and Animas Valley (NMACP 2014). Although potential wintering habitat exists in the project site, the Sprague's pipit is not known to occur in the vicinity and the removal of common desert grassland would have no effect on this Federal candidate bird species.

The Proposed Action would have no effect on the following species from Table 3-31 because the species were not observed in the biological survey and the mine area does not contain essential habitat elements or essential prey species: narrow-headed garter snake, southwestern willow flycatcher, Mexican wolf, Gila trout, Rio Grande silvery minnow, Todsen's pennyroyal.

Federally-Listed Species the Project May Affect: As discussed in Section 3.6, Groundwater Resources, and in the previous section on vegetation impacts, groundwater drawdown of the deep aquifer would only have a minimal direct effect on water in the shallow alluvium and would not likely cause a measureable effect on surface stream flows of either Las Animas Creek or Percha Creek in the reaches of these creeks that support riparian and aquatic vegetation and habitat. As such, it may affect three of the special status species listed in Table 3-30, including the Federally-listed Chiricahua leopard frog, yellow-billed cuckoo (Western DPS), or Mexican spotted owl. Nevertheless, the likelihood and severity of these possible incremental effects are being evaluated and any measures necessary to mitigate adverse effects are being determined through consultation with the USFWS in compliance with Section 7 requirements of the Endangered Species Act.

C**hiricahua Leopard Frog:** The Chiricahua Leopard Frog requires different habitats at each stage in the species' life history to maintain a reproducing population. These habitats include: permanent or nearly permanent water that is free or relatively free from non-native predators and not overly polluted by livestock excrement or chemical pollutants; shallow water with emergent and perimeter vegetation that provide egg deposition, tadpole and adult thermoregulation sites and foraging sites; deeper water, root masses, and undercut banks that provide refuge from predators and potential hibernacula during the winter; substrate that includes some mud that allows for the growth of alga and diatoms (food for tadpoles) and to allow for hibernacula; and a diversity or complex of nearby aquatic sites including a variety of lotic and lentic aquatic habitats to provide habitat for breeding, post-breeding, and dispersing individuals (USFWS 2008). Potential habitat was observed but the frog itself was not observed during Parametrix reconnaissance-level field surveys in Percha Creek and Las Animas Creek (Intera 2012).

The project site is within Recovery Unit 8 (USFWS 2007) with extant populations of the frog. Las Animas Creek is occupied. The action area of the project includes the aquatic and riparian area along Las Animas Creek that could be affected by groundwater drawdown from mine operations and the area that covers the reasonable dispersal capability of the frog. Reasonable dispersal could be within 1 mile overland, 3 miles along an ephemeral or intermittent drainage, and 5 miles along permanent water courses from a known occupied habitat (USFWS 2008). Frog populations are known to occur in Cuchillo Creek and in at least three other drainages (and in dirt tanks in the vicinity of these drainages) in Sierra County (BLM 2013), but these would not be within a reasonable dispersal distance from the project site.

Yellow-billed Cuckoo (Western DPS): The disruption and changes to natural river and stream processes, which help the development and regeneration of riparian vegetation, have been identified as a threat to the yellow-billed cuckoo (Western DPS) (USFWS 2014). Lack of an adequate food supply is another threat for the cuckoo, which forages almost entirely in native riparian habitat. The cuckoo is primarily dependent on large caterpillars, which depend on cottonwoods and willows. A segment of Las Animas Creek, which is upstream of the area that could be impacted by groundwater drawdown, supports a diverse area of pole-sized sycamore, cottonwood, Goodding's willow, and coyote willow, and could be a food source for the cuckoo. Breeding habitat of the yellow-billed cuckoo consists of expansive blocks of riparian vegetation, especially cottonwood-willow woodland containing trees of various ages, including larger, more mature trees used for nesting and foraging (USFWS 2014). For these areas to remain as viable western yellow-billed cuckoo habitat, the dynamic transitional process of vegetation recruitment and maturity must be maintained, and without such a process of ongoing recruitment, habitat becomes degraded and is eventually lost (USFWS 2014).

Mexican Spotted Owl: Historically, the Mexican spotted owl occupied low-elevation riparian forests, but it now typically breeds and forages in dense, old-growth mixed-conifer forests along steep slopes and ravines. The owl has been recorded in all montane regions in New Mexico and may occur in piñon-juniper and cliff habitats in Sierra County; however, there are no known nest sites or activity centers in the county (BLM 2013).

3.12.2.1.2 Mine Closure/Reclamation

Reclamation of the mine site after closure would aim to restore original vegetation communities to disturbed areas. Riparian areas would not likely be affected by groundwater drawdown, however, riparian locations may be replanted to replace any vegetation mortality that may have occurred during the conduct of the mining operation if such mitigation appears warranted from post-mining field surveys. Although reclamation of disturbed areas would increase available habitat for special status species over the long-term, the pre-mining conditions were not important habitat for special status species survivability. The mine pit lake would be expected to refill after pumping ceases and would become a likely food source for special status bat species.

It is unlikely that groundwater drawdown would change the composition of the riparian plant communities. However, riparian species would be planted, after mining operations cease, to replace any riparian vegetation loss that may have occurred during the conduct of mining if such mitigation appears warranted from post-mining field surveys.

3.12.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Alternative 1 would result in approximately 185 acres less of total surface disturbance (including existing and new disturbance) than the Proposed Action (See Tables 2-1 and 2-19.) Direct and indirect impacts on special status species that could occupy the type of habitat found on the mine site would be similar to those described for the Proposed Action, but slightly less because less potential habitat would be disturbed. Vegetation removal would have long-term impacts for the duration of the project; however, the loss of quality habitat available to sustain special status species would be small in extent and minor in magnitude.

The spatial extent of drawdown of the deeper groundwater table along Las Animas Creek near the water supply wells would be greater. However, the extent of the riparian area that could experience a change in plant community composition would still be considered negligible with no or discountable impacts expected to special status species that inhabit the affected area. Mine closure and reclamation impacts to special status species would also be similar to the Proposed Action.

The likelihood and severity of possible effects to Federally-listed species are being evaluated and any measures necessary to mitigate adverse effects are being determined through consultation with the USFWS in compliance with Section 7 requirements of the Endangered Species Act.

3.12.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Alternative 2 would result in approximately 142 acres less of total surface disturbance (including existing and new disturbance) than the Proposed Action. (See Tables 2-1 and 2-29.) This would be offset to a minor degree by the loss of approximately 30 acres of habitat to substation construction outside the mine area. Direct and indirect impacts on special status species that could occupy the type of habitat found on the mine site would be the same as those described for the Proposed Action, but slightly less because less potential habitat would be disturbed. Vegetation removal would have long-term impacts for the duration of the project; however, the loss of quality habitat available to special status species would be small in extent and minor in magnitude.

The spatial extent of drawdown of the deeper groundwater table along Las Animas Creek near the water supply wells would be greater. The extent of the riparian area that could experience a change in plant community composition would still be considered negligible with no or discountable impact on special status species that inhabit the affected area. Mine closure and reclamation impacts to special status species would also be similar to the Proposed Action.

The likelihood and severity of possible effects to Federally-listed species are being evaluated and any measures necessary to mitigate adverse effects are being determined in consultation with the USFWS in compliance with Section 7 requirements of the Endangered Species Act.

3.12.2.4 No Action Alternative

There would be no new surface disturbance within and surrounding the mine area boundary and no groundwater depletions under the No Action Alternative that would result in a loss of potential habitat available for use by special status species. Existing upland and riparian plant communities suitable as habitat for special status species would be expected to continue to survive. Natural disturbances such as fire and drought, and human disturbances such as development and groundwater use, would continue to occur in the area, but the habitat now present would be expected to remain for some time into the future.

3.12.3 Mitigation Measures

The special status bird species are provided protection from harm under the Migratory Bird Treaty Act, as discussed in Section 3.10, Wildlife and Migratory Birds. Therefore, mitigation measures applicable to migratory birds would also apply to special status bird species, including avoiding ground clearing and other mine development activities during breeding and nesting season (generally March 1 through August 31) until the area is surveyed by a qualified biologist to confirm the absence of nests (on the ground and in burrows and vegetation) and nesting activity to avoid impacting migratory birds. Active nests (containing eggs or young) would be avoided until they are no longer active or the young birds have fledged. The area to be avoided around the nest would be appropriate to the species, and the size of the avoided area would be confirmed by a BLM biologist.

Prior to starting mine development activities, a bat survey of old mine shafts would be conducted to determine the seasonal occupancy and type of roost habitat provided by the shafts, such as migratory, hibernaculum, breeding, or maternity. The survey results would guide the method and time of exclusion of bats before the shafts are closed or reopened. To avoid hibernation and maternity periods, exclusion is usually scheduled for early spring or late summer/early fall (April or September-October) (Brown et al. undated). Eviction would not be attempted if the weather during any month becomes cold and windy, since the bats may not exit to forage during these conditions (Brown et al. undated).

As discussed above, the likelihood and severity of possible effects to Federally-listed species are being evaluated, and any measures necessary to mitigate adverse effects are being determined, through consultation with the USFWS in compliance with Section 7 requirements of the Endangered Species Act.

3.13 CULTURAL RESOURCES

3.13.1 Affected Environment

Cultural resources are physical manifestations of culture, specifically archaeological sites, architectural properties, ethnographic resources, and other historical resources relating to human activities, society, and cultural institutions that define communities and link them to their surroundings. They include expressions of human culture and history in the physical environment, such as prehistoric and historic archaeological sites, buildings, structures, objects, and districts, which are considered important to a culture, subculture, or community. Cultural resources can also include locations of important historic events, and aspects of the natural environment, such as natural features of the land or biota, which are part of traditional lifeways and practices. In general, prehistoric resources are those that originate from cultural activities prior to the establishment of a European presence in New Mexico in the early 17th century. Historic resources are those that date from the period of written records, which began with the arrival of the Spanish in the region.

The National Register of Historic Places (NRHP) is a listing maintained by the Federal government of prehistoric, historic, and ethnographic buildings, structures, sites, districts, and objects that are considered significant at a national, State, or local level. Listed resources can have significance in the areas of history, archaeology, architecture, engineering, or culture. Cultural resources that are listed on the NRHP, or have been determined eligible for listing, have been documented and evaluated according to uniform standards, and have been found to meet criteria of significance and integrity. Cultural resources that meet the criteria for listing on the NRHP, regardless of age, are called *historic properties*. Resources that have undetermined eligibility are treated as historic properties until a determination otherwise is made. More information on the evaluation of historic properties is provided later in this section.

3.13.1.1 Regulatory Framework

Federal Laws and Regulations: A number of Federal laws address cultural resources and Federal responsibilities regarding them. The long history of legal jurisdiction over cultural resources, dating back to the 1906 passage of the Antiquities Act (16 U.S.C. 431-433), demonstrates a continuing concern on the part of Americans for such resources. Cultural resources include historic properties, as defined in the National Historic Preservation Act (NHPA) (16 U.S.C. 470); cultural items, as defined in the Archeological and Historic Preservation Act (16 U.S.C. 469); cultural items and human remains, as defined by the Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. 3001); archaeological resources, as defined by the Archeological Resources Protection Act (ARPA) (16 U.S.C. 470aa-mm); the cultural environment, as defined by EO 11593, Protection and Enhancement of the Cultural Environment (36 Federal Register [FR] 8921); Indian sacred sites to which access is provided under the American Indian Religious Freedom Act (AIRFA) (42 U.S.C. 1996) and as defined in EO 13007 Indian Sacred Sites (61 FR 26771)); and religious practices as addressed in AIRFA and the Religious Freedom Restoration Act (RFRA) (42 U.S.C. 2000bb). Similarly, Section 101(b)(4) of NEPA establishes a Federal policy for the conservation of historic and cultural aspects of the nation's heritage. Requirements set forth in these laws, and their implementing regulations, define the BLM's responsibilities for management of cultural resources.

Foremost among these statutory provisions is Section 106 of the NHPA. Section 106 of the NHPA requires Federal agencies to take into account the effect of their undertakings on historic properties. The Advisory Council on Historic Preservation (ACHP) regulations that implement Section 106 (36 CFR Part 800) describe the process for identifying and evaluating resources; assessing effects of Federal actions on historic properties; and consulting to avoid, minimize, or mitigate those adverse effects. The NHPA does not mandate preservation of historic properties, but it does ensure that Federal agency decisions concerning the treatment of these resources result from meaningful consideration of cultural and historic values, and identification of options available to protect the resources.

The BLM has a series of manuals and handbooks that stipulate how the agency manages the cultural resources on land under its jurisdiction, and provide the BLM with guidance on implementing actions in accordance with Federal statutes. The BLM also has executed a Programmatic Agreement (PA) with the ACHP and the National Conference of State Historic Preservation Officers (SHPO) that outlines how the agency will administer its activities subject to Section 106 of the NHPA. Each State that operates under the PA has a "protocol" agreement that defines how the BLM and that State's SHPO will operate and interact. The BLM Las Cruces District Office (LCDO) follows the PA and the New Mexico Protocol to meet its Section 106 responsibilities.

As a Federal agency, the BLM has a trust responsibility to American Indian tribes (Tribes) to protect tribal cultural resources and to consult with Tribes regarding those resources. Certain laws, regulations, and executive orders guide consultation with American Indians to identify cultural resources important to Tribes and to address tribal concerns about potential impacts to these resources. Section 101(d)(6) of the NHPA mandates that Federal agencies consult with Tribes and other Native American groups who either historically occupied the mine area or may attach religious or cultural significance to cultural resources in the region. The NEPA implementing regulations link to the NHPA, as well as AIRFA, NAGPRA, RFRA, EO 13007, EO 13175 *Consultation and Coordination with Indian Tribal Governments* (65 FR 67249), and the Executive Memorandum on Government-to-Government Relations with Native American Tribal Governments (59 FR 22951). This body of legislation calls on agencies to consult with American Indian tribal leaders and others knowledgeable about cultural resources important to them. BLM manual 8120 and Handbook H-8120-1 address tribal consultation specifically, and the subject is addressed in terms of Section 106 of the NHPA in the nationwide PA and New Mexico Protocol. The BLM consulted with Tribes during development of this draft EIS and this consultation will continue through development of the final EIS.

State Statutes and Rules: In addition to Federal legislation, the State of New Mexico has statutes and rules that address cultural resources. New Mexico's Cultural Properties Act (§18-6-1 through 17 NMSA 1978) addresses a number of cultural resource-related issues, including but not limited to, prohibiting destruction of significant cultural properties on private land without the owner's consent, and regulating excavation or disturbance of unmarked human burials on any land within New Mexico outside of Federal land. Section 18-6-8.1, Review of Proposed State Undertakings, states that *"the head of any State agency or department having direct or indirect jurisdiction over any land or structure modification which may affect a registered cultural property shall afford the State Historic Preservation Officer (SHPO) a reasonable and timely opportunity to participate in planning such undertaking so as to preserve and protect, and to avoid or minimize adverse effects on, registered cultural properties"*. The implementing rule (4.10.7 NMAC) defines indirect jurisdiction as the issuance of an authorization, permit, or license by a State agency, entity, board, or commission for land modification on Federal, State, or private lands. Registered cultural properties are those listed on the State Register of Cultural Properties (SRCP).

The Prehistoric and Historic Sites Preservation Act (§18-8-1 through 8 NMSA 1978) addresses the protection of cultural properties listed on the SRCP or NRHP, stating that no State funds shall be spent on programs or projects that require the use of listed properties. Exceptions include when there is no feasible or prudent alternative to such use, or if all possible planning has occurred to preserve, protect, and minimize harm to the listed property. The implementing rule (4.10.12 NMAC) places the responsibility of the determination on the State agency, which is required to issue the determination in the form of a written record available to all interested parties.

Consultation with American Indians is also addressed by State statute. The New Mexico State–Tribal Collaboration Act (§11-18 NMSA 1978) stipulates that State agencies shall make a reasonable effort to collaborate with Indian nations, tribes, or pueblos in the development and implementation of policies, agreements, and programs of the State agency that directly affect American Indians. Pursuant to the Act, the NMED, New Mexico Energy, Minerals, and Natural Resources Department (of which the Mining and Minerals Division is a part), and the New Mexico OSE developed the Tribal Collaboration and Communication Policy. The purpose of the policy is to foster, facilitate, and strengthen positive government-to-government relations between these agencies and New Mexico's Indian Nations, Tribes, and Pueblos.

3.13.1.2 Area of Potential Effect

The area of potential effect (APE) for cultural resources is the area within which impacts to cultural resources could occur as the result of a project or undertaking. This term, defined in the NHPA, is normally applied to Section 106 compliance for assessing effects to historic properties. An APE is defined as:

> ". . . the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." (36 CFR 800.16[d])

The BLM adopted this definition for assessing the potential impacts of the proposed project on cultural resources. The BLM determined that the proposed Copper Flat mine would have the potential to impact cultural resources through direct and indirect physical impacts to resources from mine activities.

Using the definition above, the APE for this project includes the areas within which direct land disturbance from construction, operations, and reclamation activities are planned to occur, as well as from exploration activities which are defined as potentially occurring anywhere within the mine area. This APE also includes those areas within which there is the potential for indirect impacts, including changes to erosion patterns, inadvertent damage, vandalism, and illegal artifact collecting. For the Proposed Action and Alternative 1, the extent for these types of impacts is the same and includes the area within the mine area and the associated water supply pipeline and well field. For Alternative 2, the extent includes these same areas, plus the new substation proposed for State Trust Land.

The APE also includes areas where vibrations from blasting, drilling, or heavy equipment traffic could potentially impact resources. Critical distances for groundborne vibrations are established in the noise analysis in Section 3.21. (See Table 3-50.) Blasting, and the associated blast hole drilling for placement of explosives, both of which would be confined to the open pit, could impact extremely fragile historic buildings and ruins within 792 feet. Heavy equipment traffic and exploration drilling, which would occur throughout the mine area, could impact such resources within 42 feet. The extent of the latter would be the same for the Proposed Action and the two action alternatives. The extent and location of the blasting and drilling would vary depending on the size and location of the open pit, which is anticipated to be 2,500 by 2,500 feet for the Proposed Action and 2,800 by 2,800 feet for each of the two action alternatives. The APE for vibration impacts under the Proposed Action and both action alternatives includes the area within the mine area and the associated water supply pipeline and well field, plus a small area located outside the mine area southwest of the open pit.

3.13.1.3 Historical Context of the Mine Area

Cultural resources are best understood when viewed within their historical context. Contexts are the broad patterns or trends in history by which a specific resource is understood and its meaning (and ultimately its significance) within prehistory and history is made clear (NPS 1990). The following section briefly describes the major patterns of prehistory and history for the area of the proposed Copper Flat mine and its vicinity. The text in this section is based on information presented in the archaeological survey report of the proposed mine project site (Okun et al. 2013).

Prehistory: The earliest identified human settlement in North America occurred during the Paleoindian period (approximately 12,500–6,000 B.C.). Archaeological evidence from this period indicates people had a nomadic lifestyle with a subsistence strategy focused on big game hunting. Although Paleoindian groups likely utilized small game and plant foods in addition to big game, a substantial change in the subsistence strategy to these food sources marks the transition to the Archaic period (6,000 B.C.–A.D. 500). People during this period were still mobile; however, mobility was more restricted in geographical extent and was often cyclical, usually tied to the seasons. Once productive resource procurement locations were identified, people returned to these locations on a seasonal basis. This was a time of increased population and decreased mobility, evidenced by greater numbers of sites than in the Paleoindian period, the appearance of more preserved residential structures and associated features, regional variation in artifacts, and the increased presence of grinding and milling tools long before the advent of domestic plant cultivation. During the latter part of the Archaic (1500 B.C.–A.D. 500), major changes were initiated with the acceptance of horticulture (e.g., maize) into the subsistence strategy and a higher degree of sedentism. In general, this portion of the Archaic is characterized by a shift from hunting and gathering as the prime subsistence economy to horticulture, and a much higher site density is noted.

As with most areas of the American Southwest, evidence of Paleoindian people in the region is sparse. Paleoindian sites in southwestern New Mexico are mostly known from the San Augustin Plains, a large intermountain basin bounded by the Tularosa, Mogollon, and San Mateo Mountains. Within the region of the proposed project area, the frequency of Archaic sites increases throughout the Archaic period. Numerous artifacts diagnostic of the Late Archaic are the earliest artifacts found in the Copper Flat mine APE.

The Formative period (A.D. 200 to 1450), which is evidenced in the project vicinity by the Mogollon culture, bridges the gap between the Archaic period and Historic times. The Copper Flat mine is located within a cultural frontier between two branches of the Mogollon culture: the Jornada (lower Rio Grande Valley, Tularosa Basin, Sacramento Highlands, and desert regions of southern New Mexico) and the Mimbres (Mimbres Valley and Mogollon Highlands). Within each branch, similar cultural shifts are seen during this period. Housing styles evolved through various forms of pithouses and eventually to solely above-ground structures. Inhabitants aggregated into villages, usually located on valley floors, alluvial fans, or terraces near reliable water sources. Reliance on agriculture became prominent, and with expanding populations, settlement expanded into more marginal agricultural areas. Artifacts evolved over time, especially noticeable in the forms and décor of ceramics, and toward the end of the period seem to indicate increasing contact with outside cultures to the north and the south of the region. A single Mogollon rock art site constitutes the only evidence of Formative-period use of the Copper Flat mine APE.

Late in the Formative period, extensive changes swept over the region, resulting in reduction in population, smaller site size, a return to higher mobility, and more strategic flexibility. Causes hypothesized by researchers include collapse of belief systems, regional abandonment followed by resettlement, and environmental degradation. At this time, southern New Mexico, including the mine area, became heavily influenced by Casas Grandes (a settlement located in northern Mexico) and the Salado culture (located in the Tonto Basin of Arizona). Such influence is exhibited by changes in settlement features, architectural traits, and artifact morphology and decoration. By the time the Spanish arrived in the area, Casas Grandes had been abandoned and few reports are made of inhabitants in the Rio Grande Valley in southern New Mexico.

History: Early Spanish exploration in southern New Mexico was largely limited to the Rio Grande corridor and along the Camino Real de Tierra Adentro (the "Royal Road to the Interior"). The Camino Real served as the route between Santa Fe, New Mexico and Mexico City, and was used to transfer goods and supplies between those two areas. The Camino Real predominantly follows the Rio Grande through New Mexico. However, in the region of the Copper Flat mine, the Camino Real is located in the Jornada del Muerto, a dry valley located 30 miles east of the mine, on the far side of the Caballo Mountains. Thus, no trail-related settlements were established in the vicinity of the mine, and the region remained mostly uninhabited by non-Indians until the mid-19th century. At first, the major Spanish activity in southwestern New Mexico was mining of copper at the Santa Rita mine north of Silver City, started in 1800 and still in business today.

After the Mexican-American War (1846-1848), the U.S. government took an active role in making southern New Mexico a safe place for the development of commercial interests and settlement. A mining boom occurred in southwestern New Mexico in the 1860s, and the government established a line of military forts along the southern frontier designed to provide protection against the Apache. When the southern transcontinental railroad was completed in 1881, the formerly remote area of southern New Mexico was accessible to the rest of the country, opening it up for further expansion. Ranching developed as a main economic activity and attraction for settlers, and resulted in the establishment of many communities.

Sierra County's population in the mid-1800s was concentrated in established farming communities along the Rio Grande Valley and mining outposts in the Black Range. The first settlements in Sierra County were small farming villages established by Hispanic New Mexico families along the Rio Grande Valley around 1860. The first permanent settlements were located in Canada Alamosa and at Las Palomas along the Rio Grande, south of the present town of Truth or Consequences. By 1880, Las Palomas was the largest farming community in the area, with over 400 residents. In addition to farming, cattle ranching and sheep herding became important economic activities for the county in the 1880s.

Sierra County was the setting for a number of battles between the U.S. government and the Apache into the 1880s. Southern Apache from Canada Alamosa were moved to Fort Tularosa, then back to the Hot Springs Reservation in 1874. The Apache became frustrated with encroachments onto their reservation, ultimately abandoning the reservation and initiating a new period of raiding. The U.S. military staged campaigns to keep the Apache on the reservation; however, the Apache continued to raid the growing number of mining communities in the Black Range and the raids continued for half a decade. The long-standing conflict with the Apache finally ended with Geronimo's surrender in 1886.

A major historical development in Sierra County was the discovery of gold and silver in the Black Range. Communities such as Hillsboro, Lake Valley, Kingston, and Chloride were established in the 1870s, but flourished in the 1880s and 1890s with the mining boom. This was the cause of the first major Anglo population influx into the county, and the arrival of the Atchison, Topeka, and Santa Fe railway brought multitudes of prospectors hoping to strike it rich. Hillsboro, located about 4 miles west of the Copper Flat mine project, was one of the largest towns in southern New Mexico by 1907 and was the county seat until 1938. The depletion of ore and the falling prices of precious metals during World War I ended the mining boom, and with the closing of the mines these towns soon shrank in population. Even with the decline in mining enterprises, there was a surge of prospectors during the Great Depression. Modest mining operations continued around Hillsboro, and limited mining exploration continued throughout the region. A new mining boom occurred in the 1970s due to government deregulation and the worldwide depletion of metal inventories, with exploration happening throughout the region. Many of the mechanically-excavated prospect pits within the project APE are likely associated with this flurry of exploration in the late 1970s.

The Copper Flat mine was developed in the 1970s, but operated for only 3 months in 1982, closing down operations due to low copper prices. In 1986, all on-site surface facilities were removed, but the property's infrastructure, including building foundations, power lines, and water pipelines, were preserved for possible reuse in the future. In 1991, efforts were initiated to re-establish the Copper Flat mine project, and a draft EIS was completed in 1996. A final EIS was in preparation when, in 1999, the project applicant declared bankruptcy. The proposed project is the re-activation and expansion of previous mining activities performed at the Copper Flat mine in 1982.

3.13.1.4 Cultural Resource Investigations

Cultural resource investigations have been undertaken to develop the information needed to assess the potential impacts of the proposed project on cultural resources and to meet compliance requirements for applicable State and Federal regulations, particularly Section 106 of the NHPA. These investigations were conducted in accordance with State and Federal standards, and included survey and tribal consultation. These investigations are described below.

Survey: The BLM instructed NMCC to conduct cultural resource surveys of the APE. NMCC contracted Parametrix Inc. to conduct two intensive, systematic pedestrian cultural resource surveys, and Okun Consulting Solutions to conduct an additional survey. The goal of these surveys was to identify archaeological and architectural resources that meet the criteria for listing on the NRHP.

The first survey encompassed 381 acres along the existing water supply pipeline and well field on BLM, private, and State Trust lands (Mattson and Okun 2011). This survey route extended into the area within the proposed mine area. This survey was conducted to assess the potential effect on historic properties from activities intended to provide the BLM with information necessary for EIS analyses. The activities included aquifer testing and monitoring, pipeline testing and rehabilitation, discharge of water associated with the testing, and improvements to well access roads. The second survey encompassed the 2,190 acres within the mine area on BLM and private lands (Okun et al. 2013). This survey was conducted to assess the potential effect on historic properties from construction, operation, and reclamation of the proposed Copper Flat mine. The third survey included additional acreage surrounding nine existing water production wells (45 acres) and two possible locations for a new substation (100 acres) (Okun and Sullins 2015). The BLM archaeologist conducted an additional survey immediately outside the mine area, southwest of the location of the open pit, to assess potential vibrations effects from blasting and drilling.

The surveys included background research to determine the prehistoric and historic contexts of the survey area and vicinity, site file searches for information on previously recorded archaeological and architectural resources, 100 percent-coverage pedestrian survey of the APE, and recording to State or BLM standards all identified resources aged 50 years or older.

For each survey, the BLM evaluated the identified archaeological and architectural resources for NRHP-eligibility, determined the potential for effects to eligible properties from the proposed Copper Flat mine, and submitted the reports and determinations to the New Mexico SHPO for review and concurrence.

3.13.1.5 Tribal Consultation

Consultation with Tribes is required under multiple Federal and State statutes. The purposes of consultation are to elicit from tribal representatives concerns for potential impacts from the proposed project on the Tribe or resources that are significant to the Tribe, and to identify possible mitigation measures to resolve or minimize potential impacts. Formal consultation under NEPA and Section 106 was initiated with a scoping letter sent to the public, including Tribes, on February 3, 2012. No responses to these letters were received from Tribes or tribal members, and no tribal representatives attended the public scoping meetings held on February 22, 2012, in Hillsboro, New Mexico and February 23, 2012, in Truth or Consequences, New Mexico. Tribal consultation letters were sent on November 7, 2012, to the Comanche Indian Tribe, Fort Sill Apache Tribe, Hopi Tribe, Isleta Pueblo, Kiowa Tribe, Mescalero Apache Tribe, Navajo Nation, White Mountain Apache Tribe, Ysleta del Sur Pueblo, and Zuni Pueblo. (See Appendix H.) The letters described the proposed Copper Flat mine project and requested information from the Tribes on any concerns they had for potential impacts to tribally-significant resources.

Two Tribes provided responses:

- The Hopi Tribe sent a letter stating their desire to continue consultation because they believe that archaeological sites with which they are affiliated would potentially be impacted by the proposed project. They asked to receive copies of the final archaeological survey reports and the draft EIS.
- The White Mountain Apache Tribe stated that unless human remains or materials related directly to them were discovered, they were not interested in further consultation.

During the time between the availability of this draft EIS and the issuance of the final EIS and BLM’s Record of Decision (ROD), consultation with the Tribes by the BLM and State agencies will continue to ensure that Tribal concerns are understood and presented in the documentation, to identify appropriate mitigation measures, and to fulfill the requirements of relevant Federal and State statutes. Consultation with the Tribes regarding the proposed project may also continue beyond the ROD, in a manner determined during development of mitigation measures.

3.13.1.6 Evaluation of Resource Significance

The BLM evaluated the cultural resources identified in the surveys to determine if they are eligible for listing on the NRHP. The evaluation of resources located on State Trust Land was done in consultation with the State Land Office. Evaluation was conducted to determine those resources that have status as historic properties, which is needed in order to determine the effect of the project on historic properties under Section 106 of the NHPA and 36 CFR Part 800. Properties eligible for the NRHP must have significance in American history, archaeology, architecture, engineering, or culture. The guidelines for evaluation of significance can be found in 36 CFR 60.4. In order for a cultural resource to be considered significant, the resource must meet at least one of four significance criteria:

1. Association with events that have made a significant contribution to the broad patterns of our history.
2. Association with the lives of persons significant in our past.
3. Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.
4. Have yielded, or may be likely to yield, information important in prehistory or history.

The property must also possess integrity, or the ability to convey its significance. The NRHP recognizes seven aspects or qualities that, in varying combinations, define integrity: location, design, setting, materials, workmanship, feeling, and association. In the case of properties that possess traditional cultural significance, it is also important to consider the integrity of relationship and condition.

3.13.1.7 Cultural Resources in the APE

As a result of the cultural resource surveys and tribal consultation, the BLM identified cultural resources located within the APE and determined the NRHP-eligibility of those resources. These resources are described in this section. This information is derived from results of tribal consultation and the reports of the archaeological survey efforts (Mattson and Okun 2011; Okun et al. 2013; Okun and Sullins 2015).

Many of the resources identified within the APE are related to the extensive mining activity that occurred in this region from the 1870s through the Great Depression. Because of the similarities in the functions of these resources, and the features and artifacts present at them, these sites may together constitute an historic district – a concentration of sites, buildings, structures, and other resources that are unified historically. As stated in the cultural resource survey report (Okun et al. 2013:28), "the historic resources within the project area are unified by the theme of mining, which was integral to the settlement and development of the local area and broader region, and thus possess the quality of historic significance." Even individual resources that lack individual distinction and are not eligible alone for the NRHP can contribute to the broader historic context of an eligible district.

Because of the presence of similar mining-related resources throughout the Animas Hills and Black Range, extending far outside the APE, the extensive effort required to define the geographic boundary of a district and inventory the contributing resources within it has not been conducted, as it is beyond the scope of analysis for this EIS and the associated Section 106 effort. Such an effort would have to occur outside the confines of this EIS. Although a district has not been defined, it is still necessary to evaluate the resources identified within the Copper Flat mine APE to determine the potential contribution they would make to such a mining-related historic district. Therefore, each resource identified within the APE was evaluated not only in terms of its individual significance, but also for its potential to contribute to such a district.

Archaeological Resources: A total of 61 archaeological sites are located within the APE. Many of the sites are from the historic period; however, some of the sites are prehistoric in age and some sites have cultural remains from both prehistoric and historic use. Forty sites are associated with the development of historic mining in the region. These sites include mining engineering features such as mine shafts, adits, prospect pits, waste rock piles, check dams, mine claims, and cairns; transportation features such as road beds and a rock-lined pack trail; and residential features such as standing buildings, ruins of stone structures and foundations, tent platforms, dugouts, privies, a cemetery, and individual graves. Most of these mining-related sites include a scatter of artifacts that consist of fragments or whole pieces of various mining or residential items, such as ceramic dishes, bottle glass, jar glass, window glass, cans, sheet metal, machine parts, corrugated metal, clothing items such as buttons or buckles, shoes, bullets, nails, wire, lumber, and horseshoes. Seven sites appear to be associated with ranching, farming, or homesteading and include stone structure ruins, rock corrals, a windmill, and tanks. Seventeen of the sites have artifacts or features associated with Native American settlement and use of the region. These sites include scatters of artifact debris from stone tool-making or pottery fragments, and rock art.

Thirty-six of the sites have been determined individually eligible for the NRHP because of their significant association with the development of historic mining and settlement in the region, for their potential to provide important information about historic mining and settlement patterns, or for information on Native American land use. Twelve of the sites have undetermined eligibility. In these cases, more information is needed in order for an eligibility determination to be made. Additional information on these sites could be gathered by conducting archival research, or through limited archaeological excavation to determine if archaeological deposits are present subsurface, determine the function of a particular feature, or determine the integrity of a site or feature. Thirteen of the sites have been determined not eligible for listing on the NRHP because they do not have a significant association with the patterns of history in the region and do not have features or artifacts that will provide important information about the history or prehistory of the area. All of the sites were also evaluated to determine if they would contribute to the broader historic context of an historic district. Forty-one of the sites are considered to be potential contributing elements to a future mining-related historic district.

A total of 618 isolated manifestations (IMs) were identified within the APE. IMs are those archaeological resources that do not meet the BLM's criteria for definition as a site. In general, IMs are thought to result from accidental or inadvertent deposition of a few artifacts or an isolated feature, whereas a site indicates purposeful use of a particular place. The IMs in the APE consist of isolated ceramic sherds, stone artifacts, or debitage from tool making, historic metal artifacts such as cans, buckets, barrel hoops, and tool parts, wooden building debris, historic glass and ceramic artifacts such as bottles and dishes, stone cairns, prospecting pits, mine claim markers, rock piles, check dams, tanks, hearths, and single-episode trash dumps. While the documented IMs provide information on the general prehistoric and historic use of the APE, these resources lack additional data potential and are not likely to increase our understanding of local or regional prehistory or history. Thus, the BLM has determined that none of the IMs are eligible for the NRHP.

Architectural Resources: There are four historic-aged buildings located within the APE. The Hillscher House, located immediately west of the proposed tailings pond, was likely built between 1880 and 1930, and is associated with Max Hillscher, an individual significant in local history and the development of mining activities in the Copper Flat area during the early 20th century. The Hillscher House is considered to be a contributing element to a potential historic mining district. However, because of significant modifications made to the building and its poor-to-fair condition, it is not eligible individually for listing on the NRHP.

The Toney House, located immediately north of the tailings pond, resembles a northern New Mexico architectural style, and was built sometime between 1900 and 1940. Although some limited modifications have been made to the building, these changes are consistent with the style of the building and were conducted more than 50 years ago, making them part of the building's history. Because of the intact condition of the building, its role as a prominent landmark for residents and miners in the early twentieth century, and its association with the development of mining in the area, the Toney House has been determined eligible for listing on the NRHP, and is considered to be a contributing element to a potential historic mining district.

The Gold Dust building resembles a New Mexico vernacular architectural style and is estimated to have been built between 1900 and 1920. It is part of the historic mining town of Gold Dust, and is located just outside the mine area immediately south of the proposed tailings pond. While it is in very poor condition, the historic architectural elements of the building are intact. Although some limited modifications have been made to the building, these changes were conducted more than 50 years ago, making them part of the building's history. Because the building is the only remaining structure of the late nineteenth- and early twentieth-century community of Gold Dust, and due to its association with the development of mining in the area, the Gold Dust building has been determined eligible for listing on the NRHP, and is considered to be a contributing element to a potential historic mining district.

Greyback Shack is a single-room rock building that is within the late 1800s mining community of Placeres. It is located between two proposed topsoil stockpiles in the northeast portion of the mine area.

It is estimated that the building was constructed between 1880 and 1920. Although the building is not consistent with any particular architectural style, it is similar to other structures dating to the same period in the Copper Flat area. Because it is not a good example of any particular architectural style, and due to its generally poor condition and lack of original architectural features, Greyback Shack is not individually eligible for listing on the NRHP. However, because it is the most intact structure in the mining community of Placeres, it is considered to be a contributing element to a potential historic mining district.

Tribally-Significant Resources: None of the consulted Tribes has identified specific resources with cultural significance. The Hopi Tribe did indicate during scoping that they anticipated archaeological sites with which they are culturally affiliated would be impacted by the project.

3.13.1.8 Section 106 Compliance Status

The BLM has conducted cultural resource surveys and tribal consultation in an effort to identify cultural resources in the APE, to ascertain their NRHP eligibility, and to determine the effect of the project on eligible historic properties. As of the beginning of the public review period of this draft EIS, the BLM has submitted the cultural resource survey reports, the results of tribal consultation, and BLM's determinations of eligibility and effect to the New Mexico SHPO for formal Section 106 review and consultation. Concurrence by the SHPO on the BLM's determinations of eligibility and effect has been received. (See Appendix H.) The BLM will consult with the ACHP, the SHPO, the interested Tribes, and NMCC to develop a PA to resolve any adverse effects to historic properties. The signed PA will be incorporated into the final EIS and BLM's ROD.

3.13.2 Environmental Effects

The following analysis details the anticipated direct and indirect effects of the project alternatives on cultural resources. Under the Proposed Action and each of the alternatives, the types of effects anticipated to historic properties within the APE are discussed, followed by the numbers of historic properties anticipated to be affected. Some of the properties identified within the APE are located away from the proposed areas of construction, operations, and reclamation, and would not be affected by the proposed project. Potential effects arising from mine development, operation, and reclamation were identified through application of the Section 106 Criteria of Adverse Effects (36 CFR Part 800.5) to historic properties, and through consultation with Tribes to learn about potential impacts to Tribally-significant resources. These two methods are discussed further below. Although operations and reclamation activities would generally occur within those areas previously impacted by construction, the potential for effects to historic properties would remain during these subsequent phases, as described below.

Criteria of Adverse Effects: Section 106 of the NHPA requires Federal agencies to take into account the effects of their actions on any district, site, object, building, or structure included in, or eligible for inclusion in, the NRHP. Implementing regulations for Section 106 provide specific criteria for identifying effects on historic properties. Effects to historic properties listed, or eligible for listing, on the NRHP are evaluated with regard to the Criteria of Adverse Effects.

> *"An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable*

effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative." (36 CFR 800.5[a][1]).

Under Section 106 and its implementing regulations, types of possible adverse effects include:

- Physical destruction of or damage to all or part of a property;
- Physical alteration of a property;
- Removal of a property from its historic location;
- Change in the character of a property's use or of physical features within a property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric, or auditory elements that diminish the integrity of a property's significant historic features;
- Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance; and
- Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of a property's historic significance (36 CFR 800.5[a][2]).

The BLM applied the Criteria of Adverse Effect to the activities proposed for mine development, operation, and reclamation to identify potential effects to historic properties identified within the APE.

Tribal Consultation: As described above, the BLM engaged in consultation with Tribes to identify Tribally-significant resources and potential effects arising from the proposed project to these resources or associated traditional practices. This information assisted the BLM in analyzing the potential effects of the undertaking under NEPA and Section 106 of the NHPA.

Significance Criteria: Types of effects, their magnitude and the likelihood of their occurrence, and the overall significance of the effects were determined based on the proximity of the property to mine facilities or infrastructure; proximity to construction, operations, or reclamation activities; and the presence of workers in the area. Because historic properties are a finite resource, and cannot be regenerated, all physical impacts to historic properties are considered to be permanent in duration. Further information on how effect significance was determined can be found in the discussion of significance criteria in Section 3.1 of this EIS.

3.13.2.1 Proposed Action

Ground disturbance from construction activities would result in direct physical impacts to historic properties, specifically archaeological sites and historic structures. There would also be the potential for physical damage to buried archaeological resources that have not yet been identified or recorded, but could be discovered during earth-moving activities. Because the locations of planned facilities and features of the mine overlie the locations of known archaeological sites and historic structures, direct physical damage to historic properties would be probable. The magnitude of the damage would range from moderate to major depending on the site, because construction would completely destroy some historic properties while only damaging portions of other properties.

3.13.2.1.1 Mine Development/Operation

Construction activities would include the use of heavy machinery for earth moving, hauling, and exploratory drilling. Analysis of the vibrations caused by these activities is detailed in Section 3.21 of this EIS, along with identification of critical distances wherein activities would cause impacts to historic structures. Based on the vibrations analysis and the location of historic structures, physical impacts to nearby historic structures would occur as a result of the vibrations generated by these activities. The impacts could include window breakage, cracking and breakage of plaster or mortar, or disarticulation of walls. Some historic structures would be in close vicinity to the sources of vibrations and others would be further away, and some structures are in better condition than others, thus the likelihood for physical impacts from vibrations would range from possible to probable. For these same reasons, the magnitude of the impact would range from negligible to major.

Construction could result in indirect physical impacts to historic properties. Construction of facilities and infrastructure, compaction of soils, and removal of vegetation would likely alter erosion patterns. As a result, new areas of erosion could develop on historic properties, moving soils and archaeological materials, thereby physically damaging those properties. The level of construction activities being undertaken at the mine area and the increased number of workers present would increase the chances that inadvertent physical impact could occur to historic properties that are planned for avoidance. The presence of workers in the area could also result in an increase in vandalism and illegal artifact collecting at historic properties. Under nominal conditions, impacts from erosion, inadvertent damage, vandalism, and illegal artifact collecting would not occur. These impacts would occur under anomalous situations. However, based on anecdotal observations for facilities of this type and size, they are anticipated to happen to some degree under the Proposed Action. Thus, the likelihood for each of these types of physical impacts to occur ranges from possible to probable. The resulting magnitude of these types of impacts would be dependent on how quickly the anomalous situation was discovered and measures taken to stop it. If discovered quickly, the impacts would be negligible; if too much time lapsed prior to discovery, the impact could be major.

Operational activities would include blast hole drilling, blasting, and the use of heavy machinery for earth moving and hauling. Based on the vibrations analysis in Section 3.21 and the location of historic structures, physical impacts to nearby historic structures would occur as a result of the vibrations generated by these activities. The impacts could include window breakage, cracking and breakage of plaster or mortar, or disarticulation of walls. Some historic structures would be in close vicinity to the sources of vibrations and others would be further away, and some structures are in better condition than others, thus the likelihood for physical impacts from vibrations would range from possible to probable. For these same reasons, the magnitude of the impact would range from negligible to major.

During the operational phase of the Proposed Action, indirect physical disturbance of historic properties could occur from changed erosion patterns, inadvertent impacts caused by mine workers, and vandalism or illegal artifact collecting by workers. In addition, there would continue to be the potential for physical damage to buried archaeological resources that have not yet been identified or recorded, but could be discovered during maintenance or operational activities. As explained above for construction activities, each of these indirect impacts would be possible to probable, and would range from negligible to major.

Direct impacts would result from ground disturbing activities and vibrations, and indirect impacts would occur from changes in erosion patterns, inadvertent damage, vandalism, and illegal artifact collecting. These impacts would occur to known historic properties, and could extend to newly-discovered historic properties. Under the Proposed Action, direct impacts would be expected to occur to a total of 36 historic properties. Of these, 25 sites would be completely destroyed, 3 sites would have large portions damaged, and 7 sites would have small portions damaged. One site would be at risk for damage from vibrations only. For the ten sites where a portion would be damaged, the remaining portion would be at risk for indirect impacts. Four of these 10 sites would experience impacts from vibrations as well. Three historic properties would be at risk for indirect impacts only, based on their proximity to the proposed project facilities and mine activities. Three of the architectural resources would be subject to effects from vibrations, while the fourth, the Toney House, would be demolished. Of the 47 historic properties in the

APE, a total of 39 properties, or 83 percent, would be physically impacted. The impact of the Proposed Action on historic properties would be significant, and would result in an adverse effect to historic properties as determined under Section 106 of the NHPA. (See Table 3-32.)

3.13.2.1.2 Mine Closure/Reclamation

Reclamation activities have the same potential for physical impacts to historic properties as operational activities. Vibration impacts to historic structures would occur as a result of the use of heavy machinery for earth moving and hauling. Changed erosion patterns, inadvertent impacts caused by mine workers, and vandalism or illegal artifact collecting by workers, as well as the potential for physical damage to buried archaeological resources that have not yet been identified or recorded, could all occur during the reclamation phase of the proposed project. As explained above for operational activities, each of these impacts would be possible to probable, and would range from negligible to major in magnitude. The Proposed Action would result in physical impacts to historic properties during the construction, operations, and reclamation phases of the project.

3.13.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The same types of physical impacts to historic properties as identified for the Proposed Action are anticipated to occur under Alternative 1. These impacts would be possible to probable in likelihood, and would range from negligible to major in magnitude.

Alternative 1 would result in physical impacts to historic properties during the construction, operations, and reclamation phases of the project. Direct impacts would result from ground disturbing activities and vibrations, and indirect impacts would occur from changes in erosion patterns, inadvertent damage, vandalism, and illegal artifact collecting. These impacts would occur to known historic properties, and could extend to newly-discovered historic properties. Under Alternative 1, direct impacts would be expected to occur to a total of 31 historic properties. Of these, 19 sites would be completely destroyed, 3 sites would have large portions damaged, and 8 sites would have small portions damaged. One site would be at risk for damage from vibrations only. For the 11 sites where a portion would be damaged, the remaining portion would be at risk for indirect impacts. Four of these 11 sites would experience impacts from vibrations as well.

Four historic properties would be at risk for indirect impacts only, based on their proximity to the proposed project facilities and mine activities. Three of the architectural resources would be subject to effects from vibrations, while the fourth, the Toney House, would be demolished. Of the 47 historic properties in the APE, a total of 35 properties, or 74 percent, would be physically impacted. The impact of this alternative on historic properties would be significant, and Alternative 1 would result in an adverse effect to historic properties as determined under Section 106 of the NHPA. (See Table 3-32.)

3.13.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The same types of physical impacts to historic properties as identified for the Proposed Action are anticipated to occur under Alternative 2. These impacts would be possible to probable in likelihood, and would range from negligible to major in magnitude.

Alternative 2 would result in physical impacts to historic properties during the construction, operations, and reclamation phases of the project. Direct impacts would result from ground disturbing activities and vibrations, and indirect impacts would occur from changes in erosion patterns, inadvertent damage, vandalism, and illegal artifact collecting. These impacts would occur to known historic properties, and could extend to newly-discovered historic properties. Under Alternative 2, direct impacts would be expected to occur to a total of 32 historic properties. Of these, 20 sites would be completely destroyed, 6

Table 3-32. Summary of Anticipated Impacts Under the Proposed Action and Action Alternatives for Historic Properties

Table 3-32. Summary of Anticipated Impacts Under the Proposed Action and Action Alternatives for Historic Properties

Site Number	NRHP Eligible?	Anticipated Impacts		
		Proposed Action – 17,500 tons per day (tpd)	Alternative 1 – 25,000 tpd	Alternative 2 – 30,000 tpd
13121	Yes	complete destruction of site	complete destruction of site	complete destruction of site
13130	Yes	small portion of site damaged, indirect impacts	indirect impacts	small portion of site damaged, indirect impacts
13131	Yes	complete destruction of site	complete destruction of site	complete destruction of site
13135	Yes	small portion of site damaged, indirect impacts	small portion of site damaged, indirect impacts	complete destruction of site
50092	Yes	vibrations	vibrations	vibrations
82278	Yes	small portion of site damaged, indirect impacts, vibrations	small portion of site damaged, indirect impacts, vibrations	small portion of site damaged, indirect impacts, vibrations
82279	Yes	small portion of site damaged, indirect impacts, vibrations	small portion of site damaged, indirect impacts, vibrations	small portion of site damaged, indirect impacts, vibrations
82280	Yes	complete destruction of site	small portion of site damaged, indirect impacts	complete destruction of site
82281	Yes	large portion of site damaged, indirect impacts	small portion of site damaged, indirect impacts	large portion of site damaged, indirect impacts
82282	Yes	complete destruction of site	no impacts anticipated	no impacts anticipated
110753	Yes	complete destruction of site	complete destruction of site	complete destruction of site
110754	Undetermined	complete destruction of site	complete destruction of site	complete destruction of site
110755	Yes	complete destruction of site	complete destruction of site	small portion of site damaged, indirect impacts
110756	Yes	complete destruction of site	complete destruction of site	no impacts anticipated
110757	Yes	complete destruction of site	complete destruction of site	complete destruction of site
110758	Undetermined	complete destruction of site	complete destruction of site	complete destruction of site
110759	Yes	large portion of site damaged, indirect impacts, vibrations	large portion of site damaged, indirect impacts, vibrations	large portion of site damaged, indirect impacts, vibrations
110760	Undetermined	complete destruction of site	complete destruction of site	complete destruction of site
110762	Yes	complete destruction of site	complete destruction of site	complete destruction of site
110766	Yes	complete destruction of site	complete destruction of site	complete destruction of site

Table 3-32. Summary of Anticipated Impacts Under the Proposed Action and Action Alternatives for Historic Properties (Concluded)

Site Number	NRHP Eligible?	Anticipated Impacts		
		Proposed Action – 17,500 tons per day (tpd)	**Alternative 1 – 25,000 tpd**	**Alternative 2 – 30,000 tpd**
171042	Undetermined	small portion of site damaged, indirect impacts	small portion of site damaged, indirect impacts	large portion of site damaged, indirect impacts
171043	Undetermined	complete destruction of site	small portion of site damaged, indirect impacts	large portion of site damaged, indirect impacts
171353	Yes	complete destruction of site	complete destruction of site	complete destruction of site
171354	Yes	complete destruction of site	complete destruction of site	complete destruction of site
171355	Yes	complete destruction of site	complete destruction of site	complete destruction of site
171356	Yes	complete destruction of site	large portion of site damaged, indirect impacts	complete destruction of site
171357	Yes	small portion of site damaged, indirect impacts	indirect impacts	large portion of site damaged, indirect impacts
171359	Yes	indirect impacts	indirect impacts	indirect impacts
171360	Yes	large portion of site damaged, indirect impacts	large portion of site damaged, indirect impacts	large portion of site damaged, indirect impacts
171362	Undetermined	indirect impacts	indirect impacts	indirect impacts
171364	Yes	indirect impacts	no impacts anticipated	no impacts anticipated
171365	Yes	complete destruction of site	complete destruction of site	complete destruction of site
171366	Undetermined	complete destruction of site	no impacts anticipated	no impacts anticipated
171367	Yes	complete destruction of site	complete destruction of site	complete destruction of site
171369	Undetermined	complete destruction of site	no impacts anticipated	no impacts anticipated
171371	Yes	complete destruction of site	complete destruction of site	complete destruction of site
171372	Yes	small portion of site damaged, indirect impacts, vibrations	small portion of site damaged, indirect impacts, vibrations	small portion of site damaged, indirect impacts, vibrations
171375	Undetermined	complete destruction of site	complete destruction of site	complete destruction of site
171376	Yes	complete destruction of site	complete destruction of site	complete destruction of site
Summary – number of sites impacted by alternative				
Completely destroyed		25	19	20
Large portion damaged		3	3	6
Small portion damaged		7	8	5
Vibration impacts only		1	1	1
Indirect impacts only		3	4	2
Total		**39**	**35**	**34**

sites would have large portions damaged, and 5 sites would have small portions damaged. One site would be at risk for damage from vibrations only. For the 11 sites where a portion would be damaged, the remaining portion would be at risk for indirect impacts. Four of these 11 sites would experience impacts from vibrations as well. Two historic properties would be at risk for indirect impacts only, based on their proximity to the proposed project facilities and mine activities. Three of the architectural resources would be subject to effects from vibrations, while the fourth, the Toney House, would be demolished. Of the 49 historic properties in the APE, a total of 34 properties, or 69 percent, would be physically impacted. The impact of this alternative on historic properties would be significant, and Alternative 2 would result in an adverse effect to historic properties as determined under Section 106 of the NHPA. (See Table 3-32.)

3.13.2.4 No Action Alternative

There would be no additional effects to cultural resources with selection of the No Action Alternative. The BLM would not approve NMCC's plan of operation and there would be no effects from mine development, operation, and reclamation. Impacts to cultural resources already occurring from livestock management and access to the area by the public would continue; these include vandalism, trampling, and inadvertent damage. Under the No Action Alternative, adverse effects to historic properties would be less than significant.

3.13.3 Mitigation Measures

As described above, the BLM has determined that there would be a significant impact to historic properties from the Proposed Action and action alternatives, and any of the actions would result in an adverse effect to historic properties. The majority of these impacts would occur due to facility construction, surface activities at the mine area, removal of mineralized ore, and traffic. If either the Proposed Action or one of the action alternatives is selected by the BLM, the BLM would complete Section 106 consultation with the ACHP, SHPO, Tribes, and NMCC prior to commencement of mine development activities. The purpose of the consultation would be to develop measures to avoid, minimize, or mitigate the adverse effects to historic properties. A PA would be developed for signature by the parties, which would document the measures to be implemented. This PA would be included in the final EIS, incorporated into the ROD, and made part of the MPO.

The following measures to avoid, minimize, or mitigate adverse effects are *examples* that could be considered and included in the PA:

- Conducting data recovery excavations of archaeological sites;
- Fencing of sites and activity areas to prevent impacts;
- Implementing a monitoring program to ensure avoidance measures are effective, and to modify such measures if not effective;
- Implementing standard best management practices during construction and operations activities to control erosion and changes to erosion patterns;
- Training of NMCC construction, operations, and reclamation personnel and contractors to recognize when archaeological resources or human remains have been discovered, to recognize when inadvertent damage has occurred to a resource, to halt ground disturbing activities in the vicinity of the discovery, and to notify appropriate personnel;
- Educating NMCC personnel and contractors on the importance of cultural resources, the laws and regulations protecting cultural resources, the need to stay within defined work zones, and the legal implications of vandalism and looting.

The PA would describe the processes to be followed in the event that previously unknown cultural resources or human remains are discovered during construction or operation of the selected alternative, and would address processes to be followed in the event that inadvertent physical damage to an historic property occurred. While the effects to the resources would remain, the PA and the measures contained within it would resolve these effects and reduce the significance of the impacts. The PA would address all effects to historic properties, and would document the BLM's commitment to ensure these mitigation measures are implemented.

3.14 VISUAL RESOURCES

3.14.1 Affected Environment

The goal of this section is to identify and describe the visual resources that would be impacted by the Proposed Action. Visual resources result from the interaction between a human observer and the landscape they are observing. The subjective response of the observer to the various natural or artificial elements of a given landscape and the arrangement and interaction between them is fundamental to visual resources impacts analysis (USDA 2007).

A "viewshed" is a subset of a landscape unit and consists of all the surface areas visible from an observer's viewpoint. The limits of a viewshed are defined as the visual limits of the views located from the proposed project. A viewshed includes the locations of viewers likely to be affected by visual changes brought about by project features (Caltrans No date).

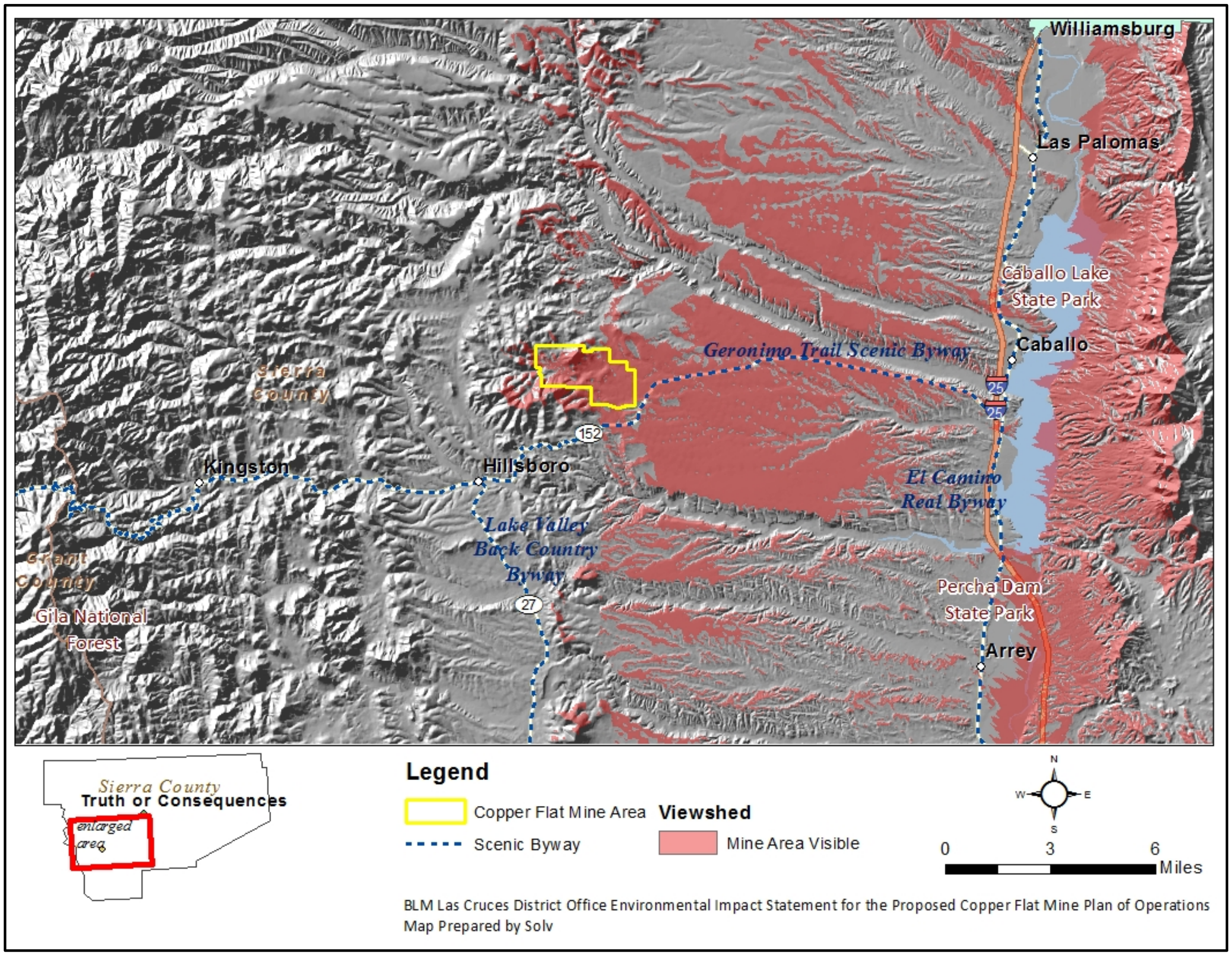
Visual management objectives were developed through the White Sands Resource Management Plan (1986) which provide the standards for the design and development for future projects. BLM-administered land is placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resources. Classes I and II are the most valued, Class III represents a moderate value, and Class IV represents the least value.

The project area crosses two categories: VRM Class III and IV. Class III objectives are to partially retain the existing character of the landscape. The level of change to the characteristic landscape can be moderate. Objectives of Class IV are to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

The BLM determines whether the potential visual impacts from proposed surface-disturbing activities or developments would meet the management objectives established for the area, or whether design adjustments would be required. A visual contrast rating process is used for this analysis, which involves comparing the project features with the major features in the existing landscape using the basic design elements of form, line, color, and texture (BLM 1984c).

The APE for visual resource impact analysis is defined as the proposed mine area and the extent of the viewshed of the proposed facilities. For visual resources, APE is synonymous with the viewshed for the proposed project. (See Figure 3-28.)

Figure 3-28. Viewshed of Proposed Copper Flat Mine



Source: BLM 2010.

The APE is in the Basin and Range province and has a landscape character typical to the province of broad, open basins bounded by prominent mountain ranges, and is covered by pinon-juniper vegetation (USFS 2009). This area is located within the foothills of the Black Range, which is a major north-south mountain chain in south-central New Mexico. To the west, the Black Range rises sharply above the Rio Grande Valley and Caballo Reservoir, which lie east of the Copper Flat mine area. Elevation at the main site ranges from approximately 5,200 to 5,500 feet amsl with Las Animas and Black peaks reaching elevations of 6,170 and 6,280 feet msl, respectively. Photographs of the existing landscape character are shown in Figures 3-29 through 3-32. The Copper Flat mine area includes remnants of previous mining activity that may distract from the surrounding landscape. NM-152, which passes less than 0.50 mile south of the Copper Flat mine area, is a designated Backcountry Byway. Interpretive displays along this driving route emphasize the historical contributions of mining and ranching to the region. A kiosk, located within view of the Copper Flat mine, describes the former Quintana Minerals operation.

Figure 3-29. View of Mine from Main Road Exit

Source: Photo by Meghan Edwards 2012.

Figure 3-30. View of Tailing Pond and Tower

Source: Photo by Meghan Edwards 2012.

Clear skies with broad, open landscapes characterize the regional landscape setting of southern New Mexico, including the project area. This type of landscape allows for long viewing distances. Consequently, maintenance of visual resources is a concern from nearby and distant viewing locations, including views from Federal land with high visual resource values, Federally-designated wilderness areas, recreation areas, major transportation routes, and population centers.

The most views of the landscape come from travelers on NM-152, who observe the mine in the middle ground of their view. (See Figure 3-28.) The areas further than 5 miles away would be able to see the mine area within their background view. Viewers more than 5 miles from the mine area would most likely be travelers on I-25, which is not listed as a scenic byway, and the background views from this route would not likely garner much attention.

Figure 3-31. View of Diversion Drain Towards Pit

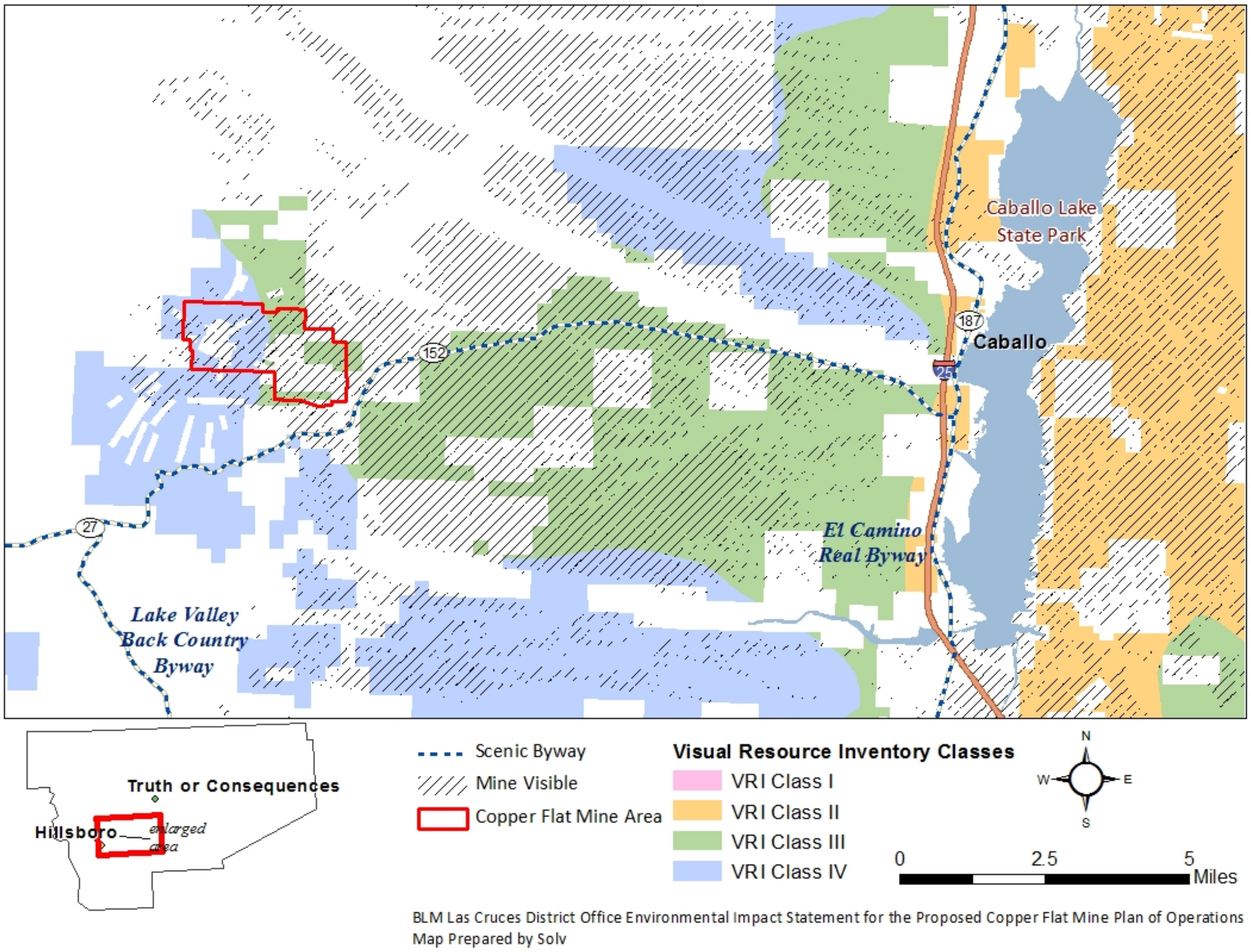
Source: Photo by Meghan Edwards 2012.

Figure 3-32. View of the Former Mill

Source: Photo by Meghan Edwards 2012.

The site was determined by the BLM in a 1996 draft EIS and 2010 VRI to be Class III (OTAK 2010). The current VRM class assignments have been reassessed as VRI classes within the Tri-County Regional Management Plan (RMP) that is in progress. (See Figure 3-33). However, the site is managed, according to the RMP, as VRM Class III and IV. The area is managed to allow activities that may have major impacts on the landscape (BLM 1986).

Figure 3-33. BLM Visual Resource Inventory



Source: BLM 2010.

3.14.2 Environmental Effects

Because visual impacts are the response of an observer, and visual observers would most likely be located outside of the mine area, this section describes impacts experienced at the middleground and farther due to changes to visual resources from proposed mining operations. The Proposed Action and alternatives would disturb approximately 1,500 acres of land, 900 acres of which are previously disturbed. Effects to the APE (viewshed) are determined by the degree of agreement with the VRM Class Objectives.

The mine area is located within gently rolling to hilly terrain that has been disturbed extensively as a result of historical mining activities. Vegetation in the area is generally dominated by creosote bush, tarbush, mesquite, littleleaf sumac, sideoats grama, and snakeweed. Existing visual contrasts generated by the open pit, waste rock disposal areas, and TSF dam constructed during past mining activities are historical features of the local topography and can be observed from many viewpoints in the vicinity.

In 1996 the BLM completed a draft EIS for mining activities. In order to assess the degree of visual contrast that would result from implementation of the Proposed Action, key observation points (KOPs) were selected at which changes to the characteristic landscape could be analyzed. KOPs are typically chosen along commonly traveled routes or at other likely observation points (BLM 1996). For the purposes of this analysis, two KOPs were chosen that provide views toward the Copper Flat mine: the southbound I-25 rest stop located approximately 3 miles north of the Caballo Lake exit (KOP 1), and the NM-152 interpretive kiosk, located adjacent to the Copper Flat mine (KOP 2). KOP 1 is located 10.5 miles east-northeast of the mine; KOP 2 is located less than 1 mile to the east of the mine area.

From KOP 1, the existing Copper Flat mine appears in background views to the west as a lightly colored band at the base of the Black Range foothills. The appearance of a light band is a result of earth disturbance associated with the existing eastern ore disposal area and TSF. Views of the plant area and pit are blocked by Animas Peak. From KOP 2 the mine appears in foreground middleground views against a backdrop formed by Animas Peak. The eastern ore disposal area contrasts moderately with the color and form of the natural landscape and tends to attract the attention of motorists on NM-152. A dark horizontal line is created by dead vegetation along the east face of the tailings dam. Man-made structures are visible and include a decant tower, twin water storage tanks, and a single-story structure. The 1996 draft EIS contains BLM Visual Contrast Rating Worksheets that include descriptions of the existing visual environment as viewed from these two KOPs (BLM 1996).

The transmission and water supply lines east of the Copper Flat mine cross a landscape dominated by the alluvial plains of the Rio Grande Valley. This area is relatively flat and dissected by small arroyos. Dominant vegetation includes creosote bush and tarbush. This area remains relatively natural in appearance, with the exception of NM-152, three transmission lines (including two related to the Proposed Action), and a windmill. This area is also classified by the BLM for Class III visual management.

3.14.2.1 Proposed Action

Construction and operations under the Proposed Action would last for a term of 16 years. Long-term effects are those that last more than 10 years. Therefore, the effects under the Proposed Action would be probable, long-term, minor to moderate, and adverse during the construction and operations phase, and long-term and beneficial under the reclamation phase.

<u>3.14.2.1.1 Mine Development and Operation</u>

Mine facilities, tailings, and WRDFs and activities would contrast with the existing landscape character, but not dominate the landscape in the middleground. Previous mine disturbance is already apparent, and therefore the change to the landscape would not be attention-demanding. The degree of contrast would be in the weak to moderate range. To minimize contrast, buildings and facilities would be painted in neutral colors to blend in with the surrounding landscape. The proposed mine buildings would comply with the objective for the Class III and IV areas within the mine area. (See Figure 3-33.) Based on the significance criteria for visual resources outlined in Section 3.1, during mine development and operation the effects to the visual resources would be probable, short- to long–term, adverse, and minor due to the contrast of the proposed mine in the Class IV VRM area.

<u>3.14.2.1.2 Mine Closure/Reclamation</u>

Effects to the landscape character during mine closure and reclamation would be beneficial as the reclamation would help return the land to a state similar to the surroundings. The waste rock disposal areas would be regraded and reclaimed to blend into the surrounding topography to the extent practicable. Disturbed areas would be revegetated with a diverse mixture of plants appropriate to the local flora. These management activities would be consistent with the VRM class objectives, which allows for major modification. However, the intent would be to make the land blend in with the surroundings and not attract attention.

3.14.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Alternative 1 would include less disturbed land but would not be fundamentally different from the effects to visual resources described under the Proposed Action. Construction and operations would last for a term of 12.5 years. Effects under Alternative 1 would be probable, long-term, minor to moderate, and adverse during construction and operations, and beneficial from reclamation.

3.14.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Alternative 2 would include less disturbed land than the Proposed Action but would not be fundamentally different from the effect to visual resources described under the Proposed Action. Construction and operations would last for a term of 12-14 years. Effects under Alternative 2 would be probable, long-term, minor to moderate, and adverse during construction and operations, and beneficial from reclamation.

3.14.2.4 No Action Alternative

Under the No Action Alternative, the mine plan of operations would not be approved, and the landscape character would not change. Therefore, no impacts to visual resource would occur.

3.14.3 Mitigation Measures

No mitigation measures for visual resources beyond regulatory requirements described in the Proposed Action have been identified for any alternative.

3.15 LAND OWNERSHIP AND LAND USE

3.15.1 Affected Environment

For purposes of analysis within this resource section, the Copper Flat site is defined as the area within the boundary of the proposed mine. In addition to the Copper Flat site, the APE includes the proposed wells, the pipeline, and the NM-152 highway corridor extending to I-25.

3.15.1.1 Local Context

The entire Copper Flat mine area lies within Sierra County. Historically, Sierra County's land has been used for agriculture, mining, and hot springs tourism. Tourism has expanded since the 1950s, especially water-based tourism that is prevalent along the nearby Elephant Butte and Caballo Lakes. The hot springs situated 20 miles northeast of the mine area near the town of Truth and Consequences draw a large number of visitors each year (see Section 3.16, Recreation). The mining history and associated ghost towns are also tourist draws in this area. Birding is an increasingly popular recreational activity in Sierra County, with its location along the Rio Grande flyway and near the Bosque del Apache National Wildlife Refuge (NWR), approximately 62 miles to the north in Socorro County (Sierra County 2006; USGS 2011).

Sierra County's agriculture includes livestock (mostly cattle) and plants, such as vegetables and chiles. In 2002, most crop farming occurred in the Rio Grande floodplain southeast of Hillsboro. Federal land in the county is used for ranching, grazing, mining, and recreation (Sierra County 2006).

Many rights-of-way are present in the project site and are an important land use issue (described further in Section 3.18, Lands and Realty). Utilities are another important land use issue (described in Section 3.25, Utilities and Infrastructure).

Land use ownership within the State of New Mexico, Sierra County, Grant County, the Copper Flat site, and the APE is compared below. (See Table 3-33.)

3.15.1.2 Area of Potential Effect (APE) and Copper Flat Site Land Use

As noted in Chapter 2, the Copper Flat site is approximately 30 miles southwest of Truth or Consequences and 5 miles northeast of Hillsboro. The APE is predominantly rural lands with mostly ranching activities (THEMAC 2011). There are no residents at the Copper Flat site. Figure 3-34 depicts the surface land ownership in Sierra County.

The major ongoing use of the Copper Flat site has been grazing since the mine stopped operating. Rangeland and livestock impacts are addressed in Section 3.19, Range and Livestock.

3.15.1.3 Sensitive Land Uses Near Copper Flat Mine

Per the significance criteria outlined in Section 3.1, the magnitude of impacts to land use are evaluated based on conflicts with existing land use plans. Several types of land uses near the Copper Flat mine may be sensitive to changes in nearby land use in and around the Copper Flat mine area and have the potential to create land use conflict. Military uses can be affected by surrounding activities. New residential and commercial development along with increasing competition for land, airspace, and water access can constrain training, testing and other military base activities (NCSL 2013). For example, nighttime lighting from communities can reduce the effectiveness of night vision training. White Sands Missile Range is the closest military facility at 33 miles east of the APE boundary and 43 miles east of the Copper

Flat mine area boundary (USGS 2011). Similarly, airports are impacted by other land uses, especially ones that are sensitive to noise such as residences and schools (FAA no date). The nearest airport is 18 miles northeast of the APE and 22 miles northeast of the Copper Flat mine area boundary (ESRI 2010).

Some wildlife and wildlife-related recreation are sensitive to nearby land uses. San Andres NWR is the closest NWR at 43 miles southeast of the APE and 53 miles southeast of the Copper Flat mine area boundary (USGS 2011). Impacts to listed species are analyzed in Section 3.12, Threatened, Endangered, and Special Status Species.

There are some sites near the Copper Flat mine that are listed on the NRHP. Several of these are located in Hillsboro. The closest NRHP-listed site is 2.8 miles southwest of the APE and 3.2 miles southwest of the Copper Flat mine area boundary (NPS 2007). Impacts to cultural resources are analyzed in Section 3.13, Cultural Resources.

3.15.1.4 Land Management Guides

The following paragraphs describe pertinent Federal, State, and local land management guidance.

Bureau of Land Management: The BLM manages public land for multiple uses including recreation; grazing; mineral extraction and processing; watershed management; fish and wildlife habitat; wilderness; and natural, scenic, scientific, and historical values (BLM 2012c). Resource management plans (RMPs) guide BLM land management. The land use decisions in the RMPs give direction to activities such as grazing, mining, and recreation.

The 1986 White Sands RMP provides the current guidance for BLM land management decisions in Sierra County. The White Sands RMP identifies the Copper Flat mine as a mineral resource and recognizes that it could again become a producing mine, although no mining has occurred at the site since 1982 (BLM 1986). The White Sands RMP provides guidelines for land and resource management and covers disposal and withdrawals of public land, which are not proposed as part of this project.

Many regulations dictate energy and mineral resources management on BLM land. One example is the regulations developed under the Mining and Minerals Policy Act of 1970, which addresses domestic mining. From these various regulations and policies, the BLM devised 11 guiding principles for managing energy and mineral resources on its public land. Four relevant principles that relate to land use are listed below (BLM 2008a):

1. BLM land use planning and multiple-use management decisions will recognize that energy and mineral development can occur concurrently and sequentially with other resource uses, providing that appropriate stipulations or conditions of approval are incorporated into authorizations to prevent unnecessary or undue degradation, reduce environmental impacts, and prevent a jeopardy opinion.
2. Land use plans will incorporate and consider energy and geological assessments as well as energy and mineral potential on public land through existing energy, geology, and mineral resource data, and to the extent feasible, through new mineral assessments to determine mineral potential.

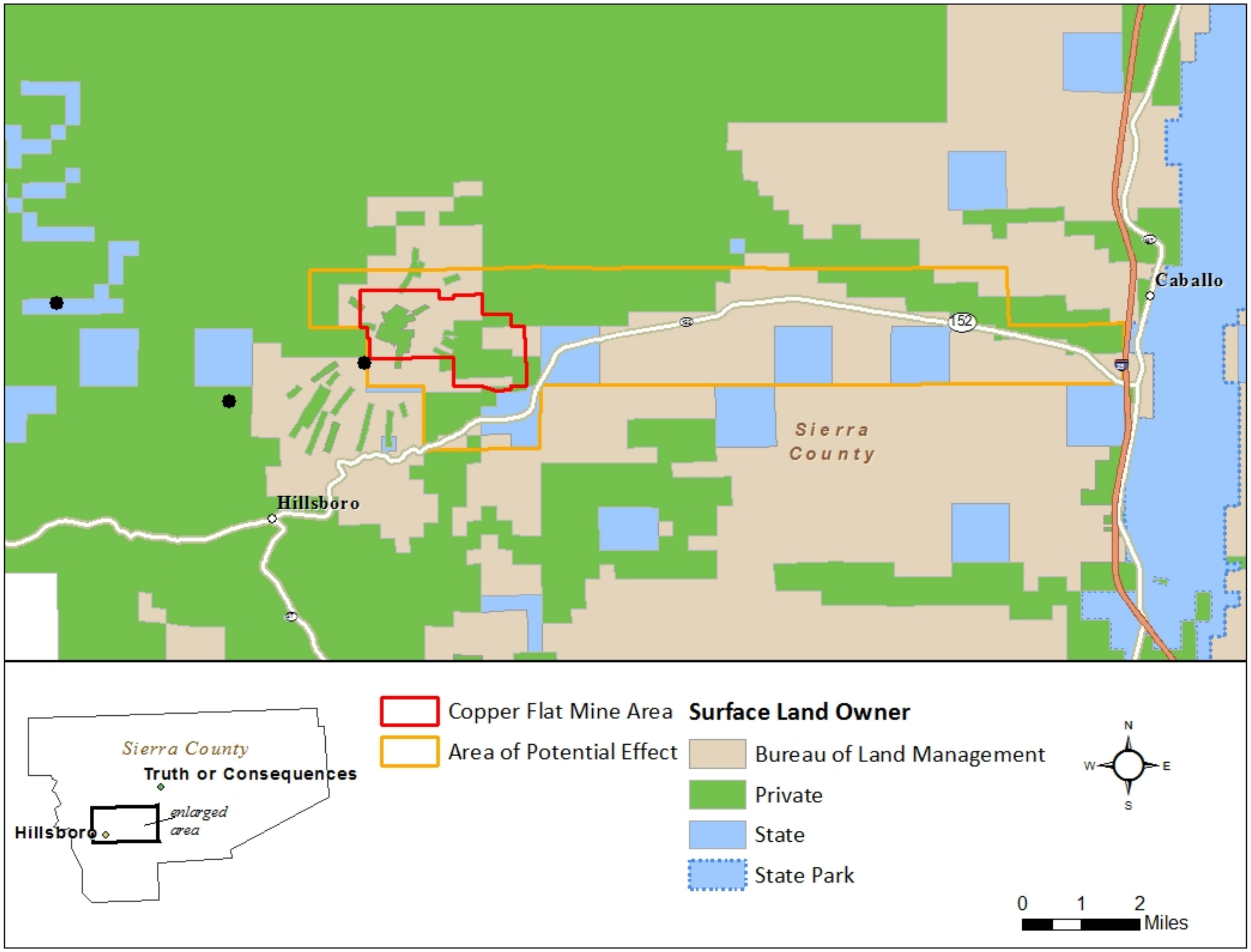
Table 3-33. Acreage and Percent Ownership for Surface Landowners in State, Counties, APE, and Project Site

Table 3-33. Acreage and Percent Ownership for Surface Landowners in State, Counties, APE, and Project Site										
	New Mexico		Grant County*		Sierra County		APE		Copper Flat Site	
Landowner	Acres	Percentage	Acres	Percentage	Acres	Percentage	Acres	Percentage	Acres	Percentage
Private	34,043,470	44	976,136	38	686,271	25	6,104	39	961	44
New Mexico State Game and Fish	199,569	0	2,413	0	0	0	0	0	0	0
New Mexico State Park	118,910	0	0	0	63,650	2	0	0	0	0
State of New Mexico	8,987,190	12	352,427	14	294,521	11	1,824	12	0	0
Bureau of Land Management	13,490,571	17	336,360	13	773,477	28	7,585	49	1,227	56
U.S. Bureau of Reclamation	54,559	0	0	0	136	0	0	0	0	0
U.S. Department of Defense	2,521,038	3	1,660	0	536,182	20	0	0	0	0
USDA Forest Service	9,221,432	12	879,899	35	365,304	13	0	0	0	0
Other Federal Agencies	998,501	1	0	0.00	0	0	0	0	0	0
Tribal/Indian	8,191,250	11	0	0.00	0	0	0	0	0	0
Total	77,826,490	100	2,548,895	100	2,719,542	100	15,514	100	2,188	100

Source: BLM 2012; ESRI 2010.

Note: * Grant County is included for comparison as the closest county to the proposed project site. Grant County also has a history of mining.

Figure 3-34. Surface Landowners in the APE



Source: BLM 2012.

3. The BLM will work cooperatively with surface owners and mineral operators in recognizing rights on split-estate land. In the absence of a surface owner agreement and in mining development of the Federal mineral estate on a non-Federal surface, the BLM will take into consideration surface owner mitigation requests from predevelopment to final reclamation.
4. The BLM will adjudicate and process energy and mineral applications, permits, operating plans, leases, ROWs, and other land use authorizations for public land in a timely and efficient manner and in a manner to prevent unnecessary or undue degradation. The BLM will require financial assurances, including long-term trusts, to provide for reclamation of the land and for other purposes authorized by law. Prior to mine closure, reclamation considerations should include partnerships to utilize existing mine infrastructure for future economic opportunities such as landfills, wind farms, biomass facilities, and other industrial uses.

New Mexico State Trust Land: The New Mexico State Land Office is responsible for managing State Trust land to generate income but is also responsible for ensuring that land is maintained for future productive uses. No NM State trust land is located within the proposed Copper Flat mine boundary (see Figure 3-34), so no permitting from the State Land Office is required.

Sierra County: Sierra County has limited land use regulations or guidance on the development of private land (Sierra County 2006). In fact, for unincorporated areas of Sierra County, the county government does not issue permits, except for floodplain permits. Building permits are issued at the State level (Jones and Porter-Carrejo 2012).

The Sierra County Comprehensive Plan (2006) documents the intent of less restrictive regulation and zoning for the area. Sierra County has no written zoning ordinances (Jones and Porter-Carrejo 2012). The unincorporated areas have no zoning (Whitney 2012), and no plans currently exist for updating the zoning. An update to the comprehensive plan is anticipated (Jones and Porter-Carrejo 2012).

Private land in Sierra County is guided by the *Interim Land Use Policy of Sierra County of 1991*. This policy document covers land disposition, water resources, agriculture, timber and wood products, cultural resources, recreation, wildlife and wilderness, mineral resources, access and transportation, and monitoring and compliance. The policy states that the intent of Sierra County land use planning is "to protect the custom and culture of County citizens through protection of private property rights, the facilitation of a free market economy, and the establishment of a process to ensure self-determination by local communities and individuals" (Sierra County 2006).

Sierra County's Assessor Office has use codes for assessing land for tax purposes. The Copper Flat mine has been designated as "miscellaneous," which is the code for raw land not currently utilized. The same code is given for the land surrounding the mine (Whitney 2012).

Other Permits: Other permits would be required for a mining operation. The U.S. Army Corps of Engineers would need to issue a Section 404 National Dredge and Fill permit. The Bureau of Alcohol, Tobacco, Firearms, and Explosives issues permits for use of explosives. NMEMNRD's Mining Act Reclamation Bureau is responsible for the mining permits. The NMED issues the air permits to construct and operate mines as well as groundwater discharge permits and liquid waste system discharge permits. Access permits for Gold Mine Road off of NM-152 would be required from NMDOT. A State Trust land permit would be necessary to build the proposed substation on State Trust land in Alternative 2. The New Mexico OSE manages the permits to appropriate water (THEMAC 2012).

3.15.2 Environmental Effects

The environmental effects to land use address whether the proposed uses would conflict with or impact any of the other uses, plans, or agreements. Based on the four principles described previously in this section that regulate BLM actions regarding land use, it is unlikely that any proposed project activities would conflict with the BLM or other Federal land uses, plans, or agreements. Several State permits would be required for the proposed project. (See Table 1-1.) These permits would ensure compliance with existing land uses, plans, or agreements. Unincorporated land in Sierra County has no written zoning ordinance or permitting requirements.

The following is a list, by resource category, of potential impacts to land use from mining activities. However, 52 percent of the proposed mine area has been used previously for mining activities, so these impacts would be expected to be negligible. These impacts relate to changes in land use due to impacts to the soil, water, or changing land use options during or after mining activities. More details on impacts to soil and water resources are found in Sections 3.8, 3.5, and 3.6.

- Soils
  - Change in soil productivity limiting future land use;
  - Change in soil productivity impacting vegetation limiting future land use;
  - Stockpiled mining materials causing soil contamination that limits future land uses; and
  - Trucks carrying materials causing dispersion of fine grain particulates and soils changing mine closure liability and remediation requirements.
- Water
  - Spills/solubility causing groundwater contamination that limits future land use opportunities;
  - Reduction in water availability from mine’s water use, foreclosing other land uses for a time;
  - Reduction in water availability from mine’s water use, impacting other land uses such as ranching;
  - Attraction of wildlife to discharge tailing pond, causing interference with surrounding land uses; and
  - Degradation of water quality from leaking tailing ponds, impacting future land use opportunities.
- Potential land uses
  - Limit land use options during mining;
  - Loss of appeal of area from change in character;
  - Limit land use opportunities from degradation of air quality from stockpile;
  - Climate change reducing water availability in rivers and wells causing foreclosure of other future uses for a time and impacting other land uses;
  - Change in post-mining land uses from having reclamation for the existing site (pit);
  - Provide more opportunities for future land use due to reclamation;
  - Limit land use opportunities from land degradation, which may limit residential development or other development; and

- Change in post-mining land uses for the existing site's surface facilities.

3.15.2.1 Proposed Action

3.15.2.1.1 Mine Development/Operation

Mining activities would follow BMPs to prevent soil or water impacts as described in Sections 3.8, 3.5, and 3.6. Any changes to soil or water conditions are unlikely to impact the mining area to the point where potential land use would conflict with land management plans by preventing planned land uses or permitting within or nearby the APE. Impacts to land use from changes to soil (Section 3.8) would be expected to be less than minor due to lack of conflict with local, regional, State, or Federal land use plans.

Impacts to land use would occur due to changes in land use options during the life of the mine, but these impacts are expected under normal mining activities. Because the mining area is 4 miles from the nearest urban area (Hillsboro, New Mexico), impacts that limit development options would be expected to be less than minor.

3.15.2.1.2 Mine Closure/Reclamation

The Copper Flat project site would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment, and land uses of the area. Careful consideration would be given to neighbors regarding their land use requirements including cattle grazing, alternative energy generation infrastructure such as wind and solar, and reestablishment and enhancement of original botanical and zoological species habitants. The project is designed to meet, without perpetual care, all applicable Federal and State environmental requirements following closure.

Major land uses occurring in the vicinity of the project site are mining, grazing, wildlife, watershed, and recreation. Following completion of mine closure and all reclamation activities, the mine area would continue to support these uses to a lesser degree. Proposed reclamation of the site should result in a successful program to restore the area to the productive land uses discussed above. All post-closure land uses would be in conformance with BLM 1985 White Sands RMP, and the Sierra County Comprehensive Land Use Plan, or their successor plans.

Following closure, the pit would partially fill with water from subsurface flow resulting in a permanent TSF (SRK 1995). Hydrogeologic and geochemical modeling indicates the post-closure pit lake water quality should be similar to that of the current pit lake (SRK 1995). Possible post-closure uses for the pit include a water reservoir for agricultural and grazing purposes.

Reclamation and revegetation efforts would return some areas of soil disturbance to a productive state following construction, thereby reducing the duration and magnitude of impact. Although the original physical structure of the landscape post-mining may be irreplaceable, the Copper Flat project site would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment, and land uses of the area. Impacts to land use from changes to water quality (Section 3.4) are also expected to be less than minor due to lack of conflict with local, regional, State, or Federal land use plans. While there are still some uncertainties regarding impacts to water quality (described in Section 3.4), the land use of the area would be unlikely to change due to any changes in water quality. NMCC would develop a pit lake management plan in order to comply with water quality regulations and monitor changes in water quality to the pit lake.

Land uses in and around the mining area would not be changed until after reclamation and the final land use would be congruent with previous land use. Throughout the life of the mine, nearby land uses would be affected, but after reclamation these nearby areas should return to their original condition. Although the land use would change from inactive to active mining, the land use category would not change. In addition, permitting requirements would assure compliance with existing land use regulations. Because the land use category would not change and land use regulations would be followed impacts would be expected to be short- and medium-term, less than minor, and adverse during the life of the mine and reclamation activities under the Proposed Action. Impacts from reclamation activities may be beneficial due to enhancement of the area, though these impacts would comply with existing land use plans and would therefore be less than minor in magnitude.

3.15.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The effects from mine development, operation, closure, and reclamation would be similar in nature and level as the Proposed Action. As with the Proposed Action, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements. The regulatory requirements, BMPs, and mitigation measures to be followed under Alternative 1 would be identical to those outlined under the Proposed Action. As with the Proposed Action, and for the same reasons, impacts during mining construction, operation, and reclamation would be expected to be probable, minor, short- and medium- term, and adverse.

3.15.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The effects from mine development, operation, closure, and reclamation would be similar in nature and level as Alternative 1. As with the Proposed Action and Alternative 1, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements. The regulatory requirements, BMPs, and mitigation measures to be followed under Alternative 2 would be identical to those outlined under the Proposed Action. As with the Proposed Action, and for the same reasons, impacts during mining construction, operation, and reclamation are expected to be probable, minor, short- and medium-term, and adverse.

3.15.2.4 No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action to land ownership and land use.

3.15.3 Mitigation Measures

No mitigation measures for land ownership and land use beyond BMPs and regulatory requirements described in the Proposed Action have been identified for any alternative.

3.16 RECREATION

3.16.1 Affected Environment

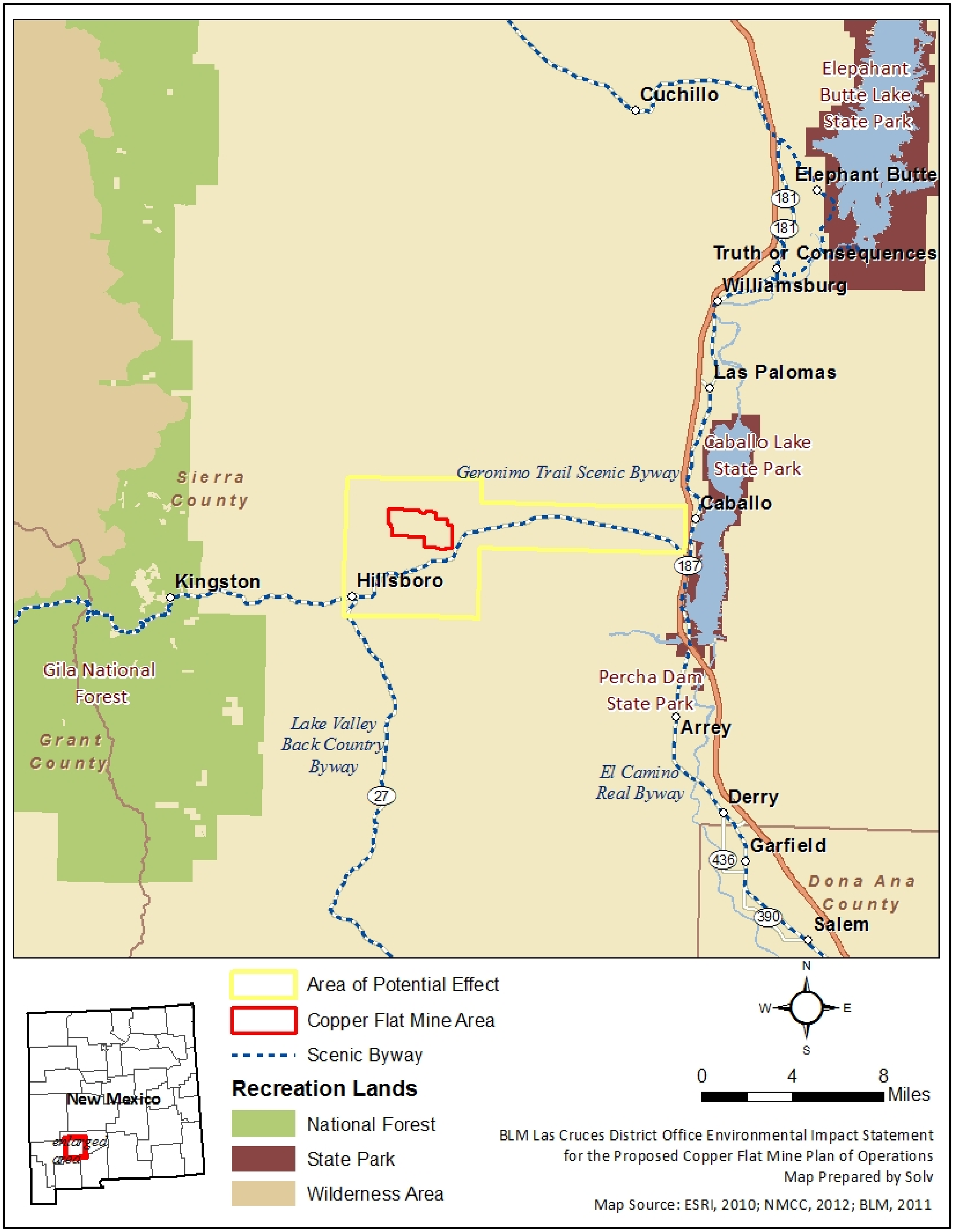
Since the discovery of hot springs early in the settlement of Truth or Consequences (formerly named Hot Springs, New Mexico) in the late 1800s, which drew visitors to local health and spa resorts formed around the hot springs, recreation has played an integral role in Sierra County's economy. Completion of the Elephant Butte Dam and Reservoir in 1916, which formed Elephant Butte Lake (New Mexico's largest lake), further expanded the County's number and type of recreational opportunities. Though low water levels have reduced tourism associated with the area's water-based recreational opportunities (boating, fishing, and water sports) over the past few years, two types of seasonal visitors come to Sierra County: winter visitors who come in October and leave in mid-March or April, and summer weekend visitors who come sporadically through September (Sierra County 2012). Visitors participate in recreational activities such as dispersed camping, use of recreational vehicle (RV) parks, golfing, hunting, off-highway vehicle (OHV) use, picnicking, sightseeing, driving along scenic backcountry byways, and hiking. Visitors frequent Elephant Butte Lake State Park, parts of the Gila and Cibola National Forests, the Black Range Mountains, Turtleback Mountain, and the banks of the Rio Grande.

Truth or Consequences, the county seat of Sierra County, still features ten commercial bathhouses managed within numerous spas, which have experienced a recent resurgence in popularity. The downtown Truth or Consequences area also features the Geronimo Springs Museum, Las Palomas Plaza, and various dining and lodging options (Sanchez 2012; Sierra County 2012). (See Figure 3-35.)

3.16.1.1 Backcountry Byways

The BLM Backcountry Byways program is a component of the National Scenic Byways system that focuses primarily on corridors along backcountry roads that have high scenic, historical, archaeological, or other public interest values. The Lake Valley Backcountry Byway and the Geronimo National Scenic Byway are the only listed byways found in the project's APE. The two byways intersect at NM-152, near the main access point for the Copper Flat mine. These byways provide opportunities for scenic views and are an integral part of the area's recreation and tourism.

Figure 3-35. Recreational Resources Within the Project Vicinity



Source: ESRI 2010; THEMAC 2011; BLM 2011.

Lake Valley Backcountry Byway: The Lake Valley Backcountry Byway is a paved, winding backcountry byway managed by the BLM. It is approximately 43 miles long; 12 miles of the byway occur on public land. It begins about 18 miles south of Truth or Consequences at the junction of I-25 and NM-152 in western Sierra County and extends west along NM-152 to Hillsboro, New Mexico, where it intersects with the Geronimo Trail National Scenic Byway. From Hillsboro, the byway follows State Highway 27 through Lake Valley and terminates at Nutt, New Mexico, at the junction of State Highways 26 and 27 in northeast Luna County. The Black Range Mountains, Caballo Mountains, Cooke's Peak, and Las Uvas Mountains are observable from the route. (See Figure 3-36.) This byway is located in an area formerly used for mining and ranching purposes during a historical settlement period. It has historical value and promotes tourism in the area (BLM 2012).

Figure 3-36. View Along Lake Valley Backcountry Byway

Source: Takemytrip.com 2008.

Figure 3-37. View Along Geronimo Scenic Trail Byway

Source: RVdreams.com 2008.

Geronimo Trail Scenic Byway: The Geronimo Trail Scenic Byway is administered by the Federal Highway Administration and is named for Geronimo, a famous Apache warrior. This byway begins at the junction of New Mexico Highways 61 and 152 in Grant County, where it offers scenic views of the Black Range Mountains.

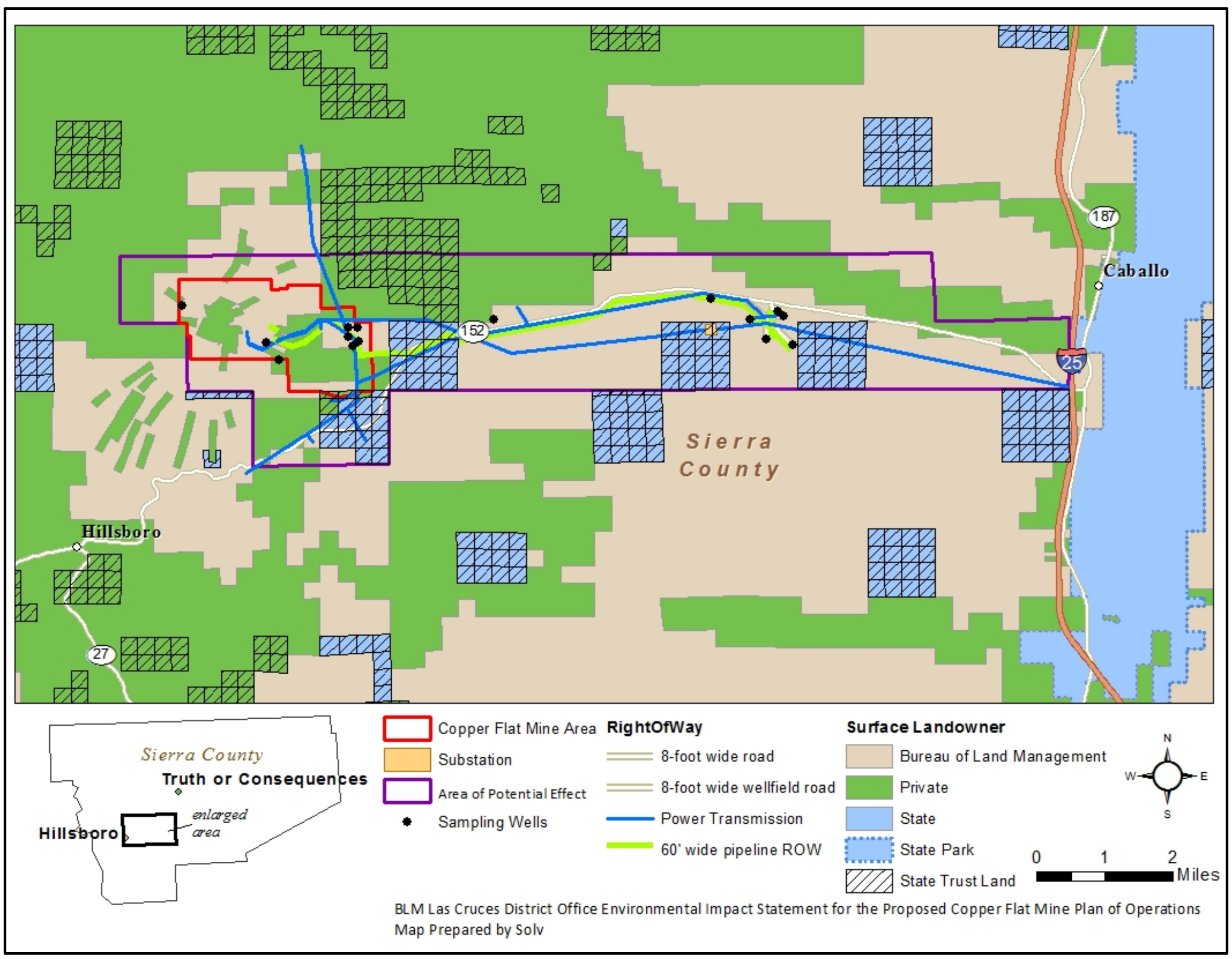
(See Figure 3-37.) The byway then moves east along NM-152 as it climbs out of the river valley and through the foothills towards Hillsboro, New Mexico. The portion of the byway that follows NM-152 is located in an area formerly used for mining, which promotes tourism through sightseeing tours of abandoned mines and ghost towns. From Hillsboro, it follows NM-152 east; this portion of the byway overlaps the Lake Valley Backcountry Byway until it meets Highway 85.

The byway moves north along Highway 85 towards Truth or Consequences, from where the Caballo Mountains and Caballo Lake can be seen. From Truth or Consequences, the byway moves north towards NM 52, where it heads west following NM 52 towards the town of Winston, New Mexico. From Winston, the route moves north along NM 52 towards NM 59. The route follows NM 59 west through the Gila National Forest, ending in Beaverhead; this portion of the route provides opportunities for wildlife and scenic viewing (Pathways Consulting Services 2008).

3.16.1.2 Other Recreational Opportunities

Hunting: Small game and big game hunting is allowed in the APE on the BLM and State Trust land properties in Sierra County. The BLM manages 16,807 acres and the New Mexico State Land Trust manages 2,563 acres of land within the APE (Hewitt 2012). (See Figure 3-38.)

Figure 3-38. BLM and State Trust Land Properties Within the APE



Source: ESRI 2010.

Hunting on State Trust land property is allowed if land is accessible by public road or across public land and not within 150 yards of a dwelling or building, not including abandoned or vacant buildings on public land (Sanchez 2012). The BLM enforces game and fish regulations through the Sikes Act, which authorizes conservation and rehabilitation programs on BLM land (BLM 2012b). The BLM also often works closely with New Mexico Department of Game and Fish (NMDGF) officers in the enforcement of wildlife and fishing regulations. The NMDGF divides New Mexico into game management units to manage big game hunting within the State; the APE is located in game management unit 21b. A variety of species, from big game to varmints and upland birds, may be hunted in the APE (BLM 2012).

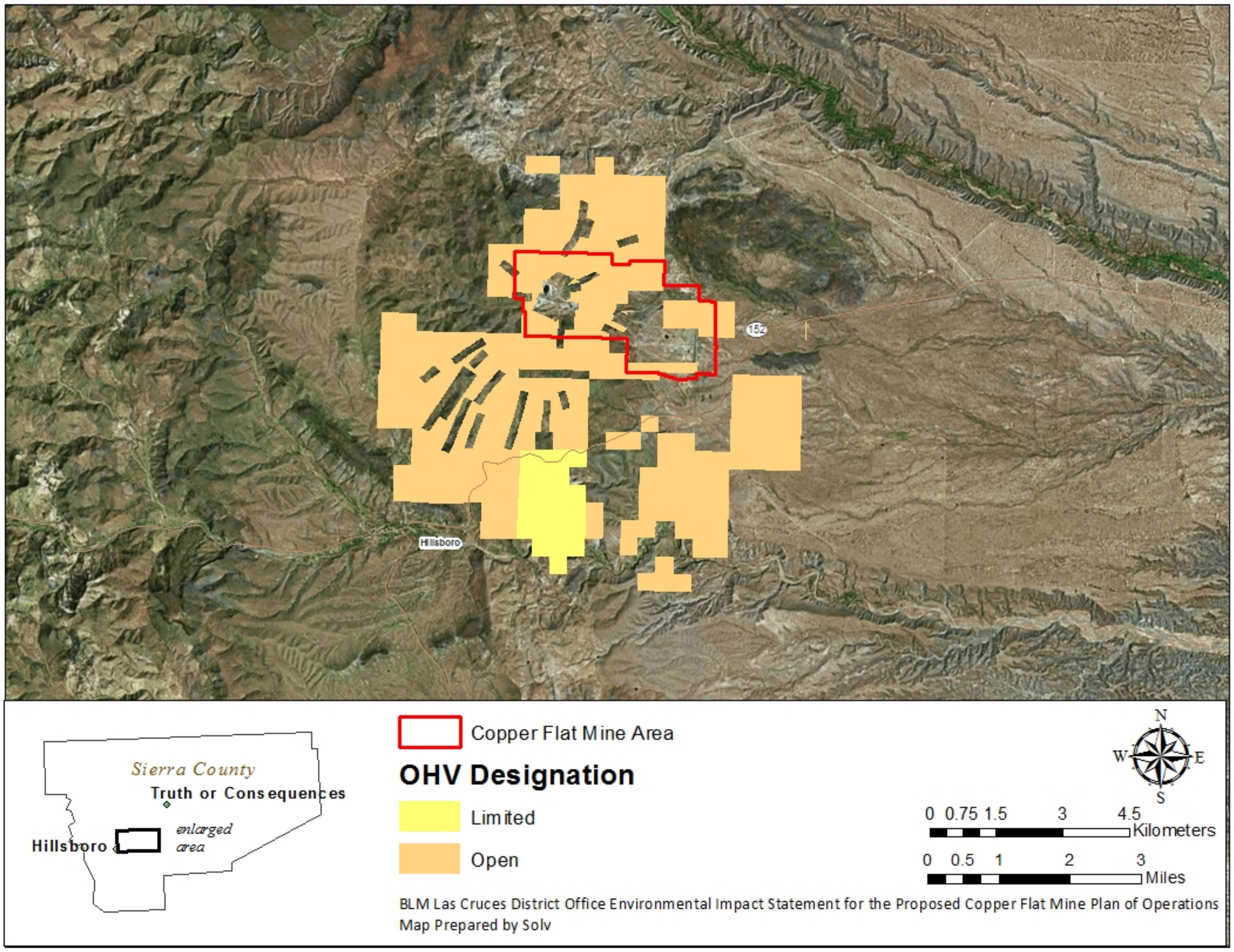
Hiking: BLM land in New Mexico is open to hiking and backpacking. With its arid, moderate climate, clean air, and scenic landscapes, Sierra County provides plenty of opportunities for hiking, in places like Animas Peak Summit. Hiking locations within the APE do not have designated trails, which mean visitors have to navigate their way through the landscape with a map, GPS, or compass.

Sightseeing: Sightseeing within the APE consists of scenic viewing from non-designated trails, BLM public land, State Trust land, and the APE's two scenic byways. Sightseeing also occurs in Hillsboro, New Mexico, home to several spots that accommodate tourism including restaurants, gift shops, galleries, museums, a bed and breakfast, a saloon, a library, a post office, and a bank (Sierra County 2012).

Off-Highway Vehicle Use: OHVs are used primarily for recreation and for transportation to recreation sites. Approximately 95 percent of the BLM-managed land in the APE is classified as open area (Hewitt 2012). An open area designation, according to the BLM's *Land Use Planning Handbook* requirements and 43 CFR 8340, is assigned to areas open to intensive OHV use where there are no compelling resource protection needs, user conflicts, or public safety issues to warrant limiting cross-country travel (BLM 2012).

The remaining 5 percent of BLM land in the APE is classified as limited (BLM 1986). A limited designation, according to the BLM's *Land Use Planning Handbook* requirements and 43 CFR 8340, characterizes areas where vehicular use must be restricted to meet specific resource management objectives. Such restrictions include limits to the use of existing roads or trails. Other limitations may include restrictions on the number or type of vehicles allowed in the area, restrictions on time or season of use, restrictions on non-permitted or unlicensed use, and limitations on the use of designated roads and trails (BLM 2012). The State of New Mexico requires mandatory registration for all OHVs used on public land, but does not require such registration on private land (NMDGF 2012). OHV use designations on public land within the APE are shown below. (See Figure 3-39.)

Figure 3-39. Off-Highway Vehicle Use Designations Within the APE



Source: ESRI 2010.

3.16.2 Environmental Effects

3.16.2.1 Proposed Action

3.16.2.1.1 Mine Development and Operation

The Copper Flat mine was operational from April to June of 1982. In 1986, all on-site surface facilities were removed and a BLM-approved program of non-destructive reclamation was carried out. Most of the property's infrastructure including building foundations, power lines, and water pipelines were preserved for reuse in the future in the event copper prices recovered sufficiently to make reestablishing the Project economically viable.

Reestablishment of the Copper Flat mine would affect 910 acres that were previously disturbed and 676 acres that would be newly disturbed land. Overall, the Copper Flat project would disturb approximately 745 acres of public land subject to unpatented mining claims controlled by NMCC and 841 acres of private land controlled NMCC. Approximately half of the proposed disturbance on public land was disturbed by the previous operation. Portions of the waste rock disposal areas, as well as the crushing facility and the mill facility, would be located on public land subject to unpatented mining claims controlled by NMCC. Approximately 28 percent of the TSF and 10 percent of the open pit would be located on public land subject to mining claims controlled by NMCC.

As identified in the Affected Environment portion of this section, recreational activities that may occur within the area include driving along the area's scenic byways, OHV use, hunting, hiking, and other nature-based activities that may occur on public land, such as birdwatching and biking. Actions associated with mine development and operation that could potentially impact these activities would include increased access road use and construction and operation of WRDFs, ore stockpiles, mill and associated processing facilities, TSF, ancillary buildings, and a water supply network. Mine development and operation is also associated with noise from drilling and blasting, and noise from the use of other mining equipment. Haul roads are not expected to create new areas of disturbance, as they would be constructed on previously disturbed land.

The construction and operation of mine-related facilities and stockpiles on undisturbed public land could impact any existing, minimal recreational use of land within the project footprint. The mining area would be fully fenced to prohibit access to the site. Though there are no designated trails within the project footprint, if recreational users are accustomed to hiking, backpacking, bird watching, or riding OHVs through the outer limits of the project footprint, impacts due to restricted use could be minor and long-term. However, due to the presence of existing mining-related structures, the open pit mine and tailings pond, and existing fencing around parts of the mine area, which already restricts access for human health and safety reasons, recreational activities in this area are not prevalent. Thus, impacts to on-foot recreationists and OHV riders are anticipated to be minor. Access restrictions related to human health and safety are discussed in greater detail in Section 3.24, Human Health and Public Safety.

Access Road Use: Access to and from the site is via 3 miles of all-weather gravel road and 10 miles of paved highway (NM-152) east to I-25, near Caballo Reservoir. As discussed previously, the Geronimo Trail Scenic Byway and the Lake Valley Backcountry Byway overlap along this portion of NM-152 (from Hillsboro east to the junction of NM-152 and Highway 85).

The impact to recreation due to increased traffic associated with mine construction and operation along this route is anticipated to be minor and long-term. This minor impact would be due to the slightly decreased capacity of NM-152, which would occasionally reduce the standard pace of scenic driving along the overlap of the byways. Impacts to the local transportation network are discussed in greater detail in Section 3.20, Transportation and Traffic.

Visual Quality: The visual or scenic quality of an area contributes to the recreational value. The Copper Flat mine area can be seen from both the Geronimo Trail Scenic Byway and the Lake Valley Backcountry Byway. It can also be seen from Caballo Lake State Park and Percha Dam State Park. However, the Copper Flat mine area is already largely developed or has been graded and cleared for mining purposes. Additional tree removal for the addition of haul roads and the construction of facilities would contribute minor and long-term adverse impacts to recreation in the area based on the increased degradation of visual quality. Visual quality affected environment and environmental effects are discussed in greater detail in Section 3.14, Visual Resources.

Noise: Impacts to recreation due to increased noise caused by drilling associated with mine construction and operation along this route are anticipated to be minor and long-term. Noise would be caused by drilling, blasting, and the use of other mine equipment. Noise from the mine equipment would comply with and would be regulated under MSHA regulations. Mufflers and other noise abatement equipment would be installed where applicable at the mine. However, even with implementation these measures, the level of noise within the project footprint would increase under the Proposed Action. This would impact recreationists' experience during use of the public land within and immediately adjacent to the project footprint by hikers and backpackers on non-designated trails. Impacts from noise associated with construction and operation of the mine is discussed in greater detail in Section 3.21, Noise and Vibrations.

Water Use: As described in Section 3.5, Surface Water Use, predictive groundwater flow modeling was conducted to determine the extent to which groundwater pumping associated with the Proposed Action would reduce surface water quantity in the project region. The Proposed Action, to process ore at a nominal throughput of 17,500 tpd, is predicted to slightly reduce streamflows in both Las Animas Creek and Percha Creek and reduce groundwater discharge to Caballo Reservoir and Rio Grande below Caballo Dam. This could potentially impact water-based recreation in Caballo Reservoir and the Rio Grande. However, recreational impacts in Caballo Reservoir and the Rio Grande are expected to be minor and temporary to medium-term, where recreational use is concerned.

All recreational impacts described above would be of small to medium extent and probable likelihood.

3.16.2.1.2 Mine Closure/Reclamation

Reclamation and revegetation would entail the removal of aboveground structures. As vegetation becomes established, visual quality would return to what is typical for a dry, desert environment. Equipment use and vehicular traffic would essentially cease following mine closure. Once reclamation was successfully completed, all features of the recreational environment would return to existing (i.e., pre-mining operation) levels.

Overall, impacts under the Proposed Action would be minor, probable, short- and medium term, and of small extent.

3.16.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The effects from mine development, operation, closure, and reclamation would be similar in nature and level as under the Proposed Action. However, Alternative 1 is predicted to cause greater surface water depletions than the Proposed Action due to its increased groundwater demand. Impacts under this alternative would be minor to moderate, probable, short- and medium-term, and of small extent.

3.16.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The effects from mine development, operation, closure, and reclamation would be similar in nature and level as Alternative 1 and the Proposed Action.

3.16.2.4 No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action to recreation.

3.16.3 Mitigation Measures

No mitigation measures for recreation regulatory requirements described in the Proposed Action have been identified for any alternative.

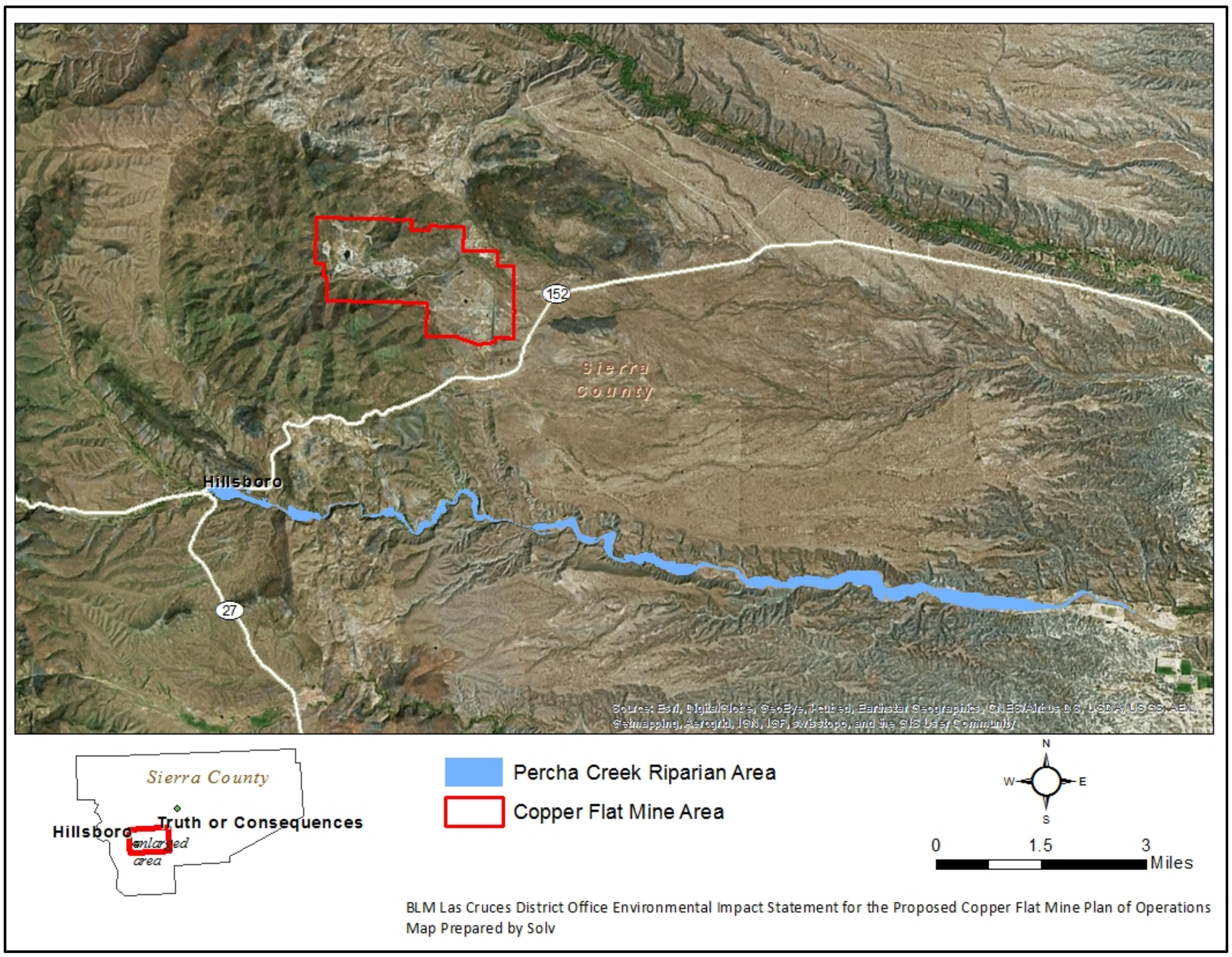
3.17 SPECIAL MANAGEMENT AREAS

3.17.1 Affected Environment

3.17.1.1 Areas of Critical Environmental Concern

The BLM designates areas of critical environmental concern (ACEC) where special management attention is needed to protect human life and safety from natural hazards or to protect and prevent irreparable damage to important historical, cultural, and scenic values; fish and wildlife resources; or other natural systems or processes. There are currently no ACECs located in Sierra County (BLM 2012). However, 870 acres of land along Percha Creek, located to the east of Hillsboro, New Mexico in close proximity to the Copper Flat mine, has been proposed as an ACEC in order to preserve and protect riparian areas, special status species, and ecological resources (Montoya 2012). It is the BLM's policy to provide temporary management to protect these significant resource values from degradation until the area is fully evaluated through the resource management planning process. The proposed ACEC is being considered in the ongoing Tri-County RMP, in which the BLM will evaluate Percha Creek's designation as an ACEC and an alternative decision of no designation. An illustration of the proposed ACEC location within Percha Creek compared to the Copper Flat mine area is shown below (BLM 1988). (See Figure 3-40.)

Figure 3-40. Map of the Proposed ACEC near Percha Creek



Source: ESRI 2010.

3.17.1.2 Backcountry and Scenic Trail Byways

The BLM Backcountry Byways program is a component of the National Scenic Byways system that focuses primarily on corridors along backcountry roads that have high scenic, historical, archaeological, or other public interest values. The Lake Valley Backcountry Byway and the Geronimo National Scenic Byway are the only listed byways found in the APE, which occurs along NM-152 where the two byways intersect (BLM 2012). The Byways are discussed in greater detail in Section 3.16.1.1, Backcountry Byways.

3.17.2 Environmental Effects

3.17.2.1 Proposed Action

3.17.2.1.1 Mine Development/Operation

Implementation of the Proposed Action is not anticipated to impact designation or management of the Percha Creek Riparian Area as an ACEC. Due to considerable distance from the project site, mining under the Proposed Action would not change the riparian areas, special status species, and ecological resources located in this area. Impacts to riparian areas are discussed further in Section 3.4, Water Quality. Impacts to special status species are discussed further in Section 3.12, Threatened, Endangered, and Special Status Species.

The Proposed Action would result in probable long-term minor to moderate and small- to medium-extent adverse impacts to the byways during the life of the project due to increased noise, traffic, and visual effects that would affect recreational activities associated with the byways. With the implementation of mitigation measures proposed in the Transportation and Traffic section, impacts to traffic on the byways would be reduced from moderate to minor. Recreational impacts on user experience due to the construction, operation, and reclamation of the Copper Flat mine are described in Section 3.16, Recreation. Under the Proposed Action, the duration of mining would be 16 years. Overall, impacts under the Proposed Action would be negligible to minor, probable, short- and long-term, and of medium extent.

3.17.2.1.2 Mine Closure/Reclamation

Impacts to all physical and biological resources would essentially cease following mine closure. Once reclamation was successfully completed, the environment surrounding backcountry byways would return to its existing (i.e., pre-mining operation) state.

3.17.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

As under the Proposed Action, implementation of Alternative 1 is not anticipated to impact designation or management of the Percha Creek Riparian Area as an ACEC, due to distance from the project site.

Alternative 1 would result in the same level of impacts to the byways as under the Proposed Action during the life of the project due to increased noise, traffic, and visual effects that would affect recreational activities associated with the byways. Recreational impacts on user experience due to the construction, operation, and reclamation of the Copper Flat mine are described in Section 3.16, Recreation. Under the Accelerated Operations Alternative, the duration of mining at the Copper Flat site would be 11 years (5 years less than the life of the mine under the Proposed Action). Impacts to the byways would cease upon reclamation following closure of the mine.

Overall impacts under Alternative 1 would be similar as those that would occur under the Proposed Action.

3.17.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The effects on the resources described in this section from Alternative 2 would be similar in nature and level as Alternative 1 and the Proposed Action.

Overall impacts under Alternative 2 would be similar as those that would occur under the Proposed Action.

3.17.2.4 No Action Alternative

Under the No Action Alternative, special management areas would be maintained as they currently are. No changes or improvements would be anticipated to occur, other than those undertaken in the course of normal activities. No impacts are anticipated under this alternative to either Percha Creek Riparian Area or the byways.

3.17.3 Mitigation Measures

Potential mitigation measures include the addition of more informational signs that identify the Copper Flat mine as a resource feature along the byways that is consistent with BLM multiple-use goals. (See Figure 3-41.) Implementation of these signs at key points may inform drivers or recreational users of the history of copper mining in the area.

Figure 3-41. Informational Sign Regarding Copper Mining in the Copper Flat Area

Source: Photo by Dave Henney 2012.

3.18 LANDS AND REALTY

3.18.1 Affected Environment

The BLM manages the land and mineral estates for over 13 million acres of public land and 13.7 million acres of Federally-owned mineral estate in New Mexico, Texas, Kansas, and Oklahoma. In accordance with the intent of Congress as stated in the Federal Land Policy and Management Act (FLPMA) (43 U.S.C. 1701 et seq.), land must be managed under the principles of multiple-use and sustained yield. As required by FLPMA, public land must be managed in a manner that protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values that, where appropriate, will preserve and protect certain public land in their natural condition; will provide food and habitat for fish and wildlife and domestic animals; and will provide for outdoor recreation and human occupancy and use by encouraging collaboration and public participation throughout the planning process. In addition, the public land must be managed in a manner that recognizes the Nation's need for domestic sources of minerals, food, timber, and fiber from the public land. The BLM's Lands and Realty program processes applications for ROWs, and performs land tenure adjustments, land exchanges, sales, acquisitions and disposals, leases and permits, and color-of-title. It also oversees workloads related to withdrawals (BLM 2012).

In addition to the mine area, the APE for land and realty includes the proposed wells, pipeline, and the NM-152 highway to the I-25 intersection. Land ownership and land use is discussed in Section 3.15, Land Ownership and Land Use. The project location information for this area is found in Table 1-1 and Figure 1-2.

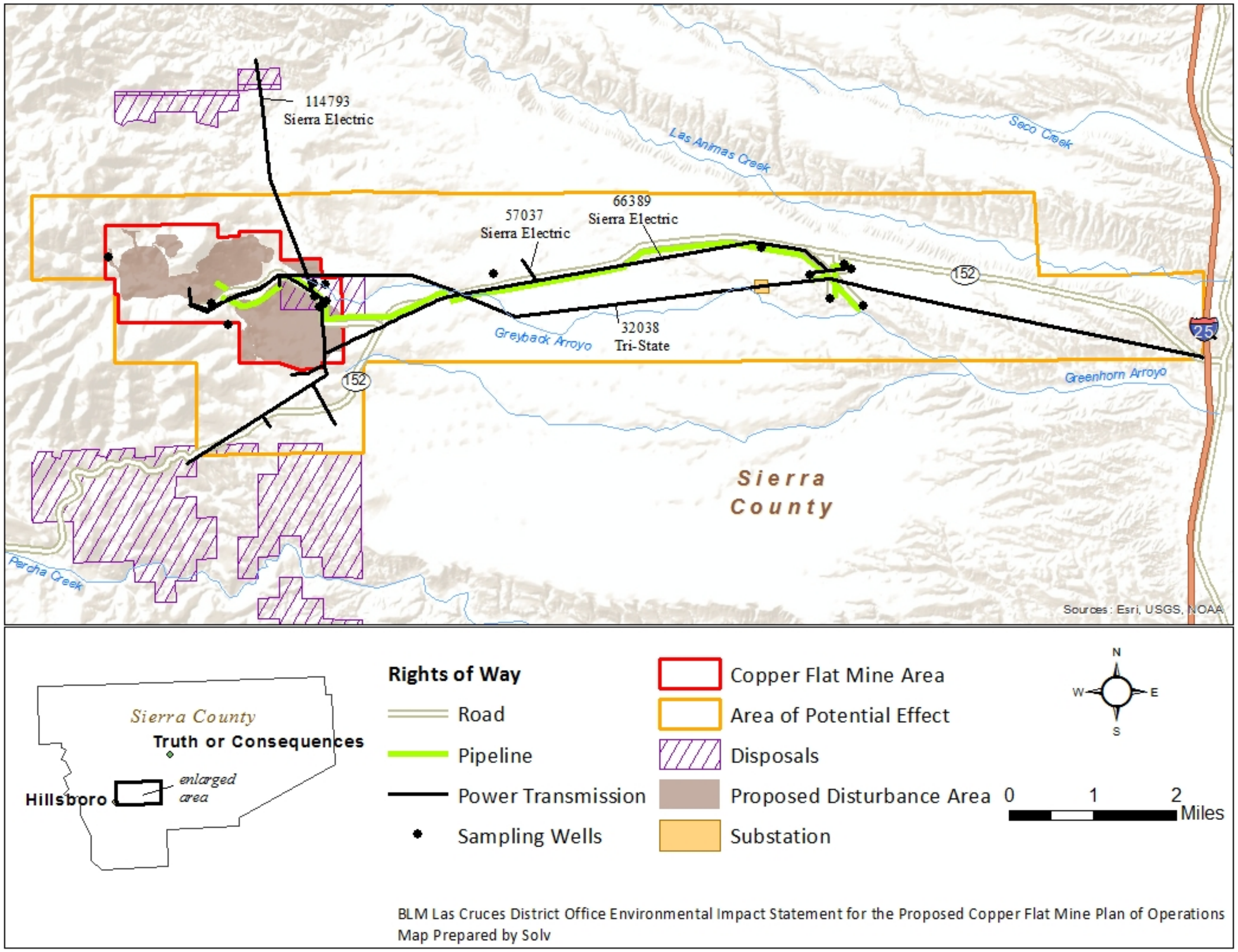
3.18.1.1 Right-of-Way Grants

A ROW grant is an agreement for the use of a specific piece of public land for a particular project, such as the development of roads, pipelines, transmission lines, and communication sites. 43 CFR 2801.5 defines a ROW grant as any authorization or instrument (e.g., easement, lease, license, or permit) that the BLM issues under Title V of FLPMA. A ROW authorizes non-exclusive use of public land, in accordance with the terms, conditions, and stipulations contained within the ROW. An important component of the BLM's ROW program is the intrastate and interstate transportation of commodities ultimately delivered as utility services (e.g., natural gas and electricity) to residential land and commercial customers. ROWs currently exist and are authorized within the APE. (See Figure 3-42.)

The BLM LCDO has granted 76,045 feet of ROW agreements related to NMCC's Copper Flat project. Descriptions of these four ROW grants are as follows (THEMAC 2011):

- ROW grants along NM-152 (See Figure 3-42.)
    - NMNM – 032038 is approximately 39,795 feet in length by 50 feet in width, containing approximately 50.8 acres. The ROW is held by Tri-State G&T Associates for a transmission line project.
    - NMNM – 114793 is approximately 7,181 feet in length by 30 feet in width, containing approximately 5.0 AF long and is held by New Sierra Electric Corporation.
    - NMNM – 057037 is 3,689 feet long. The ROW is held by the Sierra Electric Corporation and is for a transmission line project.
    - NMNM – 066389 is approximately 35,745 feet in length by 36 feet in width and is approximately 29.5 AF long. The ROW is held by the Sierra Electric Corporation for a transmission line project.

Figure 3-42. ROWs in Project Area

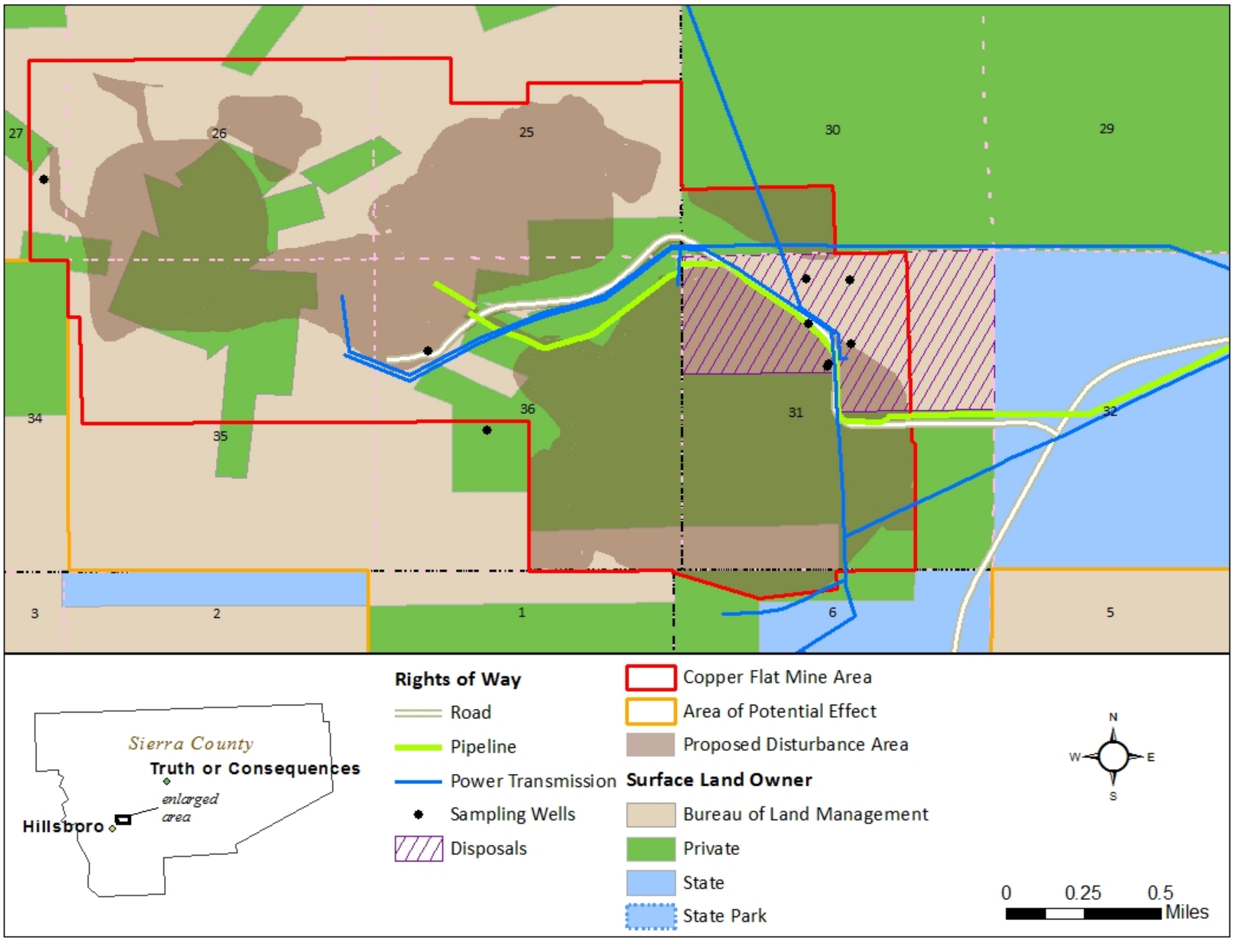


Source: BLM 2011; ESRI 2010.

Note: Substation location applies only to Alternative 2.

ROW grants in the Copper Flat mine area for purposes other than the Copper Flat mine are shown and described in Figure 3-43 and Table 3-34.

Figure 3-43. ROWs in Copper Flat Mine Area



Source: BLM 2011; ESRI 2010.

Table 3-34. ROW Grants in the Copper Flat Mine Area

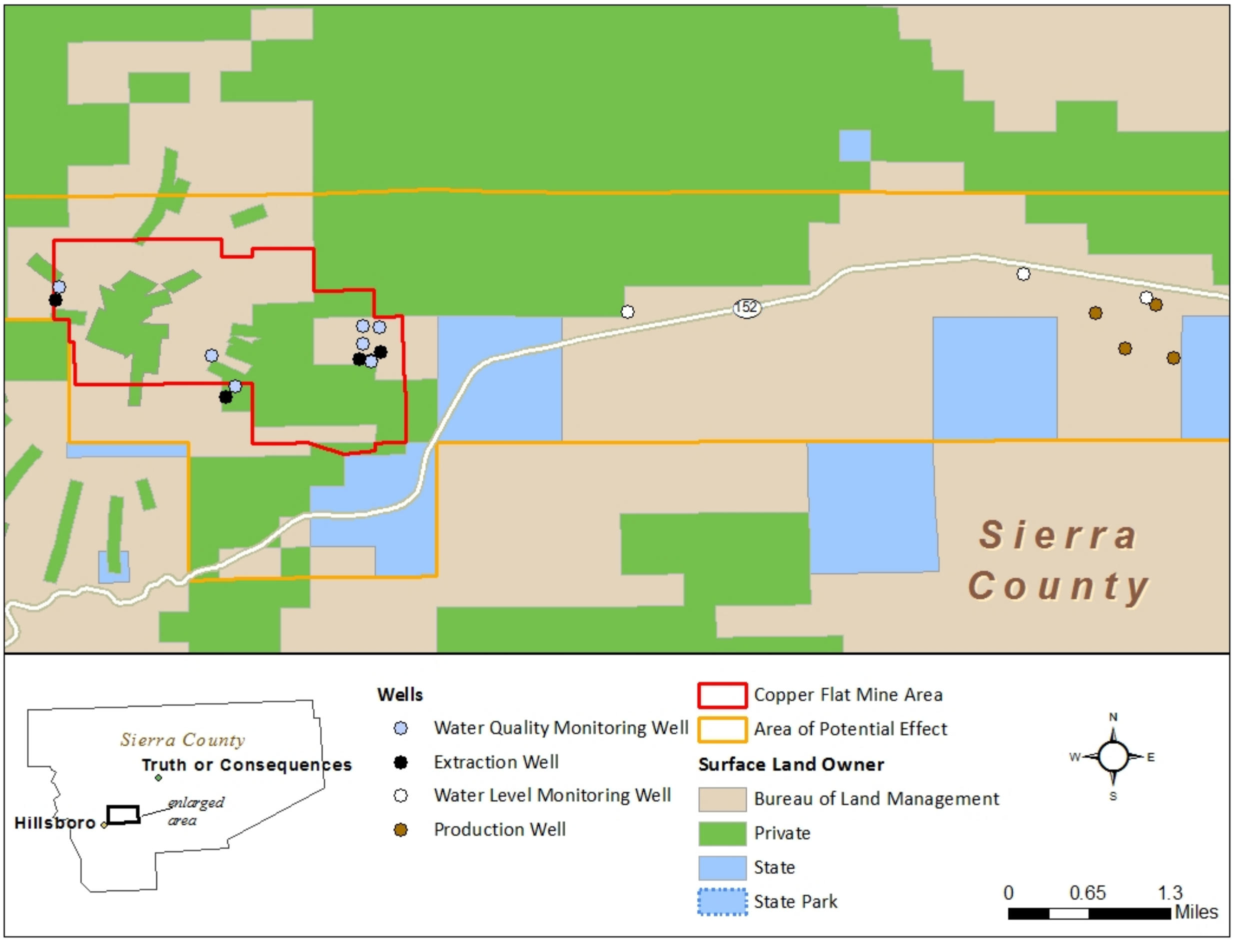
ROW	ROW Dimensions (ft)	Holder	Purpose	Connection to Proposed Action
NMNM 057029	Length: 13,844 Width: 60 Acreage: 34.7	Sierra County	Road project	Crosses the proposed tailings dam and topsoil stockpile. Sierra County is responsible for grading everything up to 500 feet of the State ROW every 6 months. Copper Flat Mine is responsible for maintaining the ROW beyond the 500 feet maintained by Sierra County.
NMNM 114793	Length: 1,785 Width: 30 Acreage: 5.0	Sierra Electric Corporation	Transmission line project	Runs along the access road used for the mine.
NMNM 125293	Length: 4,065 Width: 60 Acreage: 5.5	New Mexico Copper Corporation	Water pipeline project	Crosses the proposed tailings pond and is used in conjunction with the reclamation reservoir pond. This ROW was authorized for testing/feasibility purposes only.
NMNM 066389	Length: 15,394 Width: 36 Acreage: 29.5	Sierra Electric Corporation	Transmission line project	Runs along the access road used for the mine and crosses the proposed tailings pond. It is also run along the outside of the ancillary space located to the southwest of the plant area.
NMNM 032038	Length: 39,795 Width: 50 Acreage: 50.8	Tri-State G&T Associates	Transmission line project	Runs along the ancillary space located to the southwest of the plant area and into the transmission slab.
NMNM 057037	Length: 3,689 Width: Unknown Acreage: Unknown	Sierra Electric Corporation	Transmission line project	Runs along the access road used for the mine.

3.18.1.2 Wells

BLM has granted access to 18 wells on BLM land through rights-of-way: 11 of these are located within the APE (orange boundary) and the remaining seven are located along NM-152. (See Figure 3-44.) Descriptions of these wells are as follows:

- Four production wells would be used to supply freshwater to the mine. These wells are authorized under ROW grant NMNM – 12593. The pipeline that runs along NM-152 is ancillary to the production wells.
- Three monitoring water level testing wells (MW-5, MW-6, and MW-8) are used to monitor groundwater levels downstream of the Copper Flat project. ROWs for water facilities were previously issued by BLM for testing/feasibility purposes. These wells are authorized under ROW grant NMNM – 12593 and are located outside of the mine area along NM-152.
- Eleven extraction wells are used to monitor groundwater quality and detect seepage. These wells are authorized under ROW grant NMNM – 12593 (1 well; GWQ-9) and ROW grant NMNM – 125870 (10 wells; GWQ-1, GWQ-5, GWQ-6, GWQ-8, GWQ-10,
- GWQ-22A, GWQ-22B, GWQ-94-17, IW-3, and NP-4) and are located within the Copper Flat mine area. The 10 wells authorized under NMNM – 125870 would continue to be authorized under this grant after the mine closes.

Figure 3-44. Map of Wells



Source: BLM 2011; ESRI 2010.

3.18.1.3 Land Tenure Adjustments

The BLM manages 7,585 acres of public land within the APE (as described in Section 3.15, Land Ownership and Land Use). The BLM has the authority to make land tenure adjustments under Title II of FLPMA. Examples of such adjustment, which would require the appropriate identification made possible through the land management planning process, includes but is not limited to, acquisition, disposal, and withdrawal.

3.18.2 Environmental Effects

3.18.2.1 Proposed Action

3.18.2.1.1 Mine Development/Operation

Potential impacts to land and realty during mining operations would be unlikely because no changes are proposed to current permitting besides the ROWs issued to NMCC as discussed above. As described in Section 1.3 of the MPO, permits were previously approved for project ROWs for testing purposes. Section 5.5 of the MPO describes the reclamation plan objectives of the proposed project. The BLM would consider these ROWs as valid existing rights when conducting any land tenure adjustments. The production well/pipline ROW would be relinquished upon approval of the MPO. The approval of the MPO would allow NMCC to construct and maintain the road, powerline transmission, production and extraction wells, and pipeline ROWs listed above. The BLM's approval of the MPO and continued ROW grant administration would authorize NMCC to utilize the subject property for mining purposes, but this would not preclude the BLM's discretionary authority to allow non-mine uses, so long as those uses do not conflict with mining operation. The BLM would also retain discretionary authority to make adjustments to land tenure.

3.18.2.1.2 Mine Closure/Reclamation

One objective of the current reclamation plan is to work with local and regional communities to identify post-mining uses of the land and facilities to enhance opportunities to sustain the economy and culture in the post-mining phase of this project. Surface facilities, equipment, and buildings related to the mining project would be removed, foundations would be covered, and the plant site would be returned to conditions similar to those present before reestablishment of the mine. Working with local and regional communities could help to ensure that mine reclamation activities comply with all local and regional regulations.

Realty and land ownership in and around the mining area would not be changed until after reclamation and permitting requirements were complete. Under the Proposed Action, NMCC would ensure compliance with existing regulations, and impacts would be expected to be short- and medium-term and less than minor during the life of the mine and reclamation activities. After reclamation is complete, impacts may be beneficial due to enhancement of the area, though these impacts would be congruent with existing plans or permitting and would therefore be less than minor in magnitude.

3.18.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Effects from mine development, operation, closure, and reclamation under Alternative 1 would be similar in nature and level as the Proposed Action. As with the Proposed Action, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements. These requirements, as well as all BMPs and mitigation measures to be followed, are identical to those outlined under the Proposed Action. As with the Proposed Action, and for the same reasons, impacts during mining construction, operation, and reclamation are unlikely.

3.18.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Effects from mine development, operation, closure, and reclamation would be similar in nature and level as Alternative 1. As with the Proposed Action and Alternative 1, the mine construction, operations, and reclamation activities would be accomplished in full compliance with current New Mexico regulatory requirements. These requirements, as well as all BMPs and mitigation measures to be followed, are identical to those outlined under the Proposed Action. As with the Proposed Action, and for the same reasons, impacts during mining construction, operation, and reclamation are unlikely.

3.18.2.4 No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action to land and realty.

3.18.3 Mitigation Measures

No mitigation measures for land and realty beyond BMPs and regulatory requirements described in the Proposed Action have been identified for any alternative.

3.19 RANGE AND LIVESTOCK

3.19.1 Affected Environment

The Taylor Grazing Act, enacted by Congress in 1934, provides for the orderly use, improvement, and development of public rangelands. The Act allowed the establishment of grazing districts and the issuance of permits to graze livestock on public land. FLPMA established policy for managing BLM-administered public land under the principles of multiple-use and sustained yield. The Public Rangelands Improvement Act of 1978 further provides for the improvement of range conditions for watershed protection, livestock grazing, wildlife habitat, and other rangeland values. The rangeland program in New Mexico is managed and assessed in accordance with BLM regulations and policy (BLM 2001).

An animal unit month (AUM) is the standard measure of forage utilization. An AUM is the amount of dry forage required to sustain an animal unit, such as one cow or horse, or five sheep, for 1 month. Allowable livestock use on an allotment is based on range production balanced with management of other resources. Per 43 CFR Part 4100, Section 4110.2-2 (a) states: "Permitted use is granted to holder of grazing preference and shall be specified in all grazing permits or leases… Permitted use shall be based upon the amount of forage available for livestock grazing as established in the land use plan, activity plan or decision of the authorized officer…" The BLM grazing permittees are allowed to take nonuse in full, or in part, of the permitted numbers, per 43 CFR Part 4100, Section 4130.2 (g).

The project site (proposed mine property, pipeline/NM-152 corridor, and millsites) overlaps four grazing allotments. (See Table 3-35 and Figure 3-45.) The proposed Copper Flat mine area is primarily within the Copper Flat Ranch allotment, with small areas within the Ladder Ranch allotment and the Warm Springs Ranch allotment. The pipeline/NM-152 corridor and millsites are within the Copper Flat Ranch and South Kelly Canyon allotments. The part of the Ladder Ranch allotment that is overlapped by the mine area is in private ownership; BLM land within that allotment is located farther to the north.

Table 3-35. Grazing Allotments in Copper Flat Mine Project Site

Table 3-35. Grazing Allotments in Copper Flat Mine Project Site						
Allotment Name	**Allotment Number**	**Total Allotment/ BLM Land (Acres)**	**% Forage from BLM Land**	**Permitted Use (AUMs)[1]**	**Livestock Number[2]**	**Permit Expiration**
Warm Springs Ranch	06143	151[3] / 151	100	36	3 Cattle	12/31/2018
Ladder Ranch	16040	4,552 / 4,552	100	852	71 Bison	02/28/2022
South Kelly Canyon	16050	13,445 / 10,775[4]	70	25	3 Horses	12/09/2019
			70	958	114 Cattle	
			100	132	11 Cattle	
Copper Flat Ranch	16079	12,338 / 7,241	58	905	130 Cattle	02/28/2025
				21	3 Horses	

Source: BLM 2014.

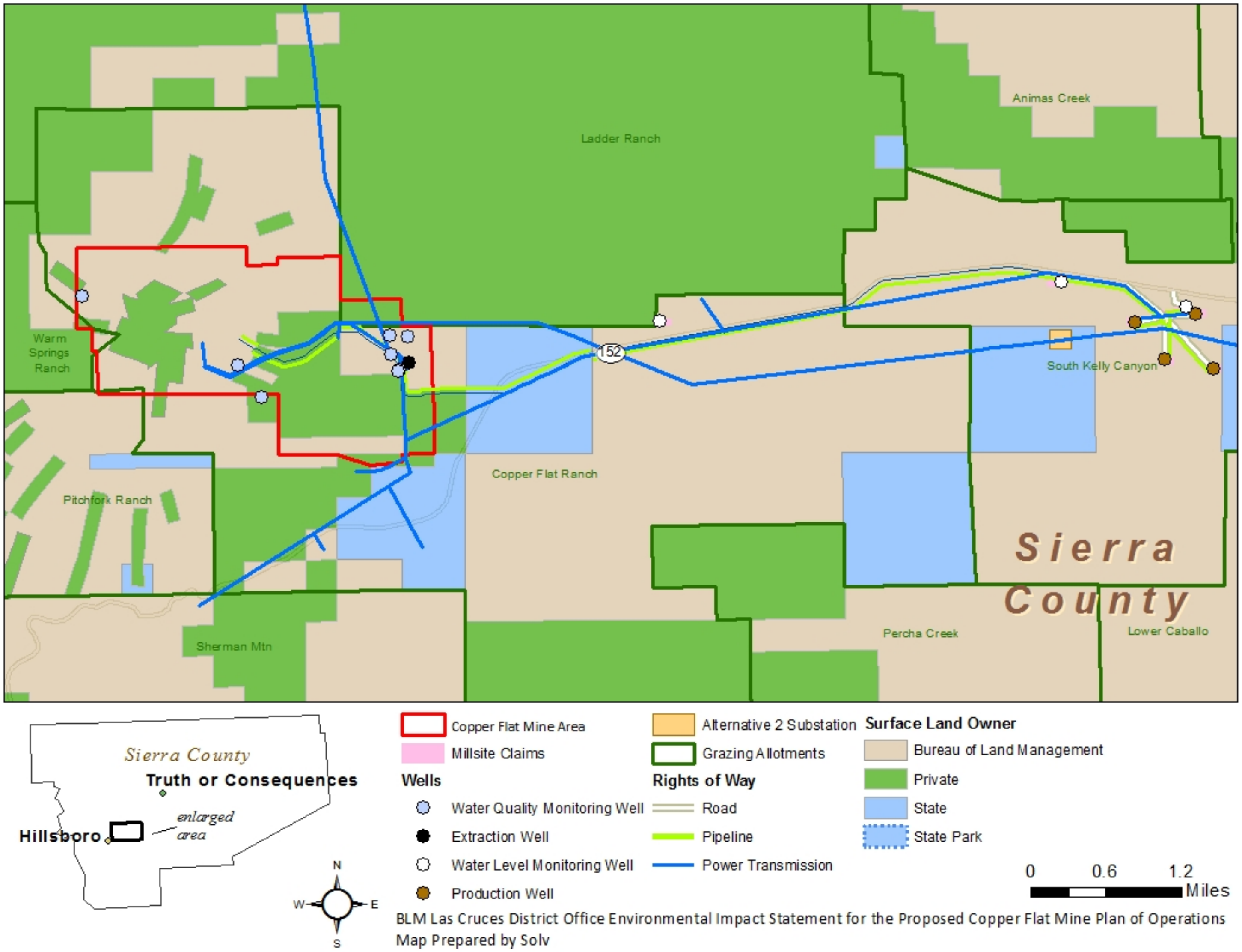
Notes: [1] For Warm Springs Ranch and Ladder Ranch: permitted use listed is for BLM land; permitted use is active; no suspended use. For South Kelly Canyon and Copper Flat Ranch, permitted use is the total number of AUMs allowed on each allotment per grazing year.

[2] Number of authorized animal units.

[3] Does not include private land; total allotment is much larger.

[4] Includes other Federal land in addition to BLM land.

Figure 3-45. Grazing Allotments that Overlap the Project Site



Source: BLM 2015.

Approximately 41.6 percent (910 acres of BLM and private land) of the proposed Copper Flat mine boundary (2,190 acres) is existing disturbed surface (Intera 2012). Relatively intact vegetation communities are present within the proposed mine area on undisturbed surfaces (as discussed in Section 3.11, Vegetation, Invasive Species, and Wetlands) and livestock grazing is an ongoing land use. The proposed pipeline corridor and millsites consist of existing roads, utilities, and groundwater well sites, but are also used for livestock grazing.

3.19.2 Environmental Effects

3.19.2.1 Proposed Action

The Proposed Action would have probable adverse impacts of long-term duration with minor to moderate magnitude on grazing use of BLM land within the allotments in the project site. Impacts would be of small (limited) extent. Vegetation removal would have long-term impacts for the duration of the project; the loss of forage available for grazing on BLM land would be small, but could possibly require a reduction in permitted AUMs. For these reasons, the impacts are considered significant.

3.19.2.1.1 Mine Development and Operation

Mine development activities would impact a total of 745 acres of BLM land (see Table 2-1) within the proposed mine area – 725 acres on the Copper Flat Ranch allotment and 20 acres on the Warm Springs Ranch allotment. Of the 745 acres, 361 acres have been previously disturbed and 384 acres would be new disturbance (THEMAC 2011).

New surface disturbance (384 acres) would occur on the Copper Flat Ranch allotment and amount to approximately 5 percent of the total BLM land (7,241 acres) within that allotment. Approximately 58 percent of the forage within the Copper Flat Ranch allotment is derived from BLM land. (See Table 3-35.) Although there would be a small reduction of available forage, the loss of 725 surface acres of BLM land amounts to approximately 6 percent of the total surface acres for the Copper Flat Ranch allotment (745/12,338). In May/June 2015, the BLM confirmed that the 1999 Copper Flat EIS analysis resulted in a reduction from 151 animal units to 133 animal units to account for development of the Quintana Minerals mine. Since this analysis was previously completed, and there would now be 384 acres of new disturbance on the Copper Flat Ranch allotment, the BLM has determined that this further reduction in surface acres does not warrant a decrease in permitted use.

The 20 acres of the Warm Springs Ranch allotment that intersects with the west edge of the proposed mine area were previously disturbed during past mining activities. The loss of 20 acres of BLM land amounts to approximately 13 percent (20/151) of the public land within the Warm Springs Ranch allotment; however, this allotment is much larger because it consists predominantly of private land. Because of the limited amount of new surface disturbance proposed, an adjustment (reduction) to permitted AUMs and authorized animal units on these allotments is not anticipated.

New Mexico follows the open range model of livestock management so NMCC proposes to fence the mine area and install gates or cattle guards at access locations to prevent livestock from entering the property. Most of the mine area fence would be four-strand barbed wire installed following the design and construction standards of BLM Fencing Handbook H-1741-1. The boundary fence could inhibit livestock movement between the far north end of the Copper Flat Ranch allotment and the remainder of the allotment located south and east of the proposed mine property.

Operation of the mine 24 hours a day would increase the volume of traffic on the mine access road and NM-152. With open range and no right-of-way fence along these roads, the risk of vehicle/livestock collisions could increase.

Construction of and upgrades to utility infrastructure (water supply, electrical power) in the pipeline/NM-152 corridor and construction staging on millsites outside the proposed mine area would have medium-term but minor adverse impacts over a small (limited) extent. Approximately 34.6 acres of BLM land would be disturbed for utility/road infrastructure (see Table 2-2) and 45 acres of BLM land for the 9 millsites at 5 acres each. Surface disturbance and loss of vegetation used as livestock forage from construction of the utilities and use of the millsites could disrupt the grazing use of the Copper Flat Ranch and South Kelly Canyon allotments until vegetation has reestablished over disturbed areas. Approximately 15 acres of utility infrastructure and 5 acres for a millsite on BLM land would be disturbed in the Copper Flat Ranch allotment, and approximately 20 acres of utility infrastructure and 40 acres for 8 millsites on BLM land would be disturbed in the South Kelly Canyon allotment. The loss of BLM land within the Copper Flat Ranch allotment for utilities and a millsite, together with the BLM land disturbed within the mine area would be approximately 6 percent of the total allotment of surface acres [(725 + 15 + 5)/12,338]; an adjustment (reduction) to permitted AUMs for this allotment may be necessary. Because the extent of the loss of BLM land within the South Kelly Canyon allotment would be a very small percentage of the total allotment [(20 + 40)/13,445 = 0.4 percent], no adjustment to permitted AUMs for this allotment would be anticipated.

Construction activities within the proposed mine area, through the pipeline/NM-152 corridor, and on millsites could have short-term indirect adverse impacts on the quality of the available forage within the allotments within the project site. As described in Section 3.11, soil compaction and erosion, fugitive dust, and the establishment or spread of invasive species can adversely affect the growth and viability of native species, which are preferred as livestock forage. Best management practices to control erosion and invasive species would minimize the short-term adverse effects of construction activities.

Drawdown of groundwater from the shallow alluvium of Las Animas Creek and Percha Creek may occur during operation of the mine and pumping of water supply wells. However, the drawdown would be negligible compared to the overall depth of the evapotranspiration layer of the alluvial groundwater so that no change to riparian plant community vigor and composition is expected (as discussed further in Section 3.11, Vegetation, Invasive Species, and Wetlands). Any grazing use of areas outside the mine area but within the drawdown contours would not be affected by any change in plant communities associated with mining operations.

3.19.2.1.2 Mine Closure/Reclamation

Reclamation of the mine area after closure would aim to restore original vegetation communities to disturbed areas to provide suitable forage for livestock, and riparian areas would be replanted to replace any tree and shrub mortality that may have occurred from groundwater table drawdown. Although reclamation of disturbed areas would increase available forage over the long term, returning grazing use of the Copper Flat Ranch allotment to pre-mining conditions would depend on the health of the rangeland following New Mexico Standards and Guidelines.

3.19.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Alternative 1 would disturb 644 acres of BLM surface (including existing and new disturbance), which is approximately 100 acres less than the Proposed Action. Direct and indirect impacts on grazing use of the allotments would be similar to those described for the Proposed Action. Vegetation removal would have long-term impacts for the duration of the project. The loss of forage available for grazing on 644 acres of BLM land within the mine area would be small and amounts to approximately 5 percent of the total Copper Flat Ranch allotment (644/12,338); a reduction in permitted AUMs and authorized animal units is not anticipated for the same reasons as described for the Proposed Action. The impact to forage and grazing allotments for construction of the utility infrastructure and millsites would be the same as the Proposed Action.

Drawdown of the groundwater in the deep aquifer along Las Animas Creek near the water well sites would be greater due to a larger area where drawdown would exceed 10 feet. However, the drawdown from the shallow alluvium would be negligible compared to the overall depth of the evapotranspiration layer of the alluvial groundwater so that no change to riparian plant community vigor and composition is expected, and any grazing use of areas outside the mine area but within the drawdown contours would not be affected.

Mine closure and reclamation impacts to grazing use would also be similar to the Proposed Action.

3.19.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Alternative 2 would disturb 630 acres of BLM land surface (including existing and new disturbance), which is approximately 115 acres less than the Proposed Action. Direct and indirect impacts on grazing use of the allotments would be the same as those described for the Proposed Action. Vegetation removal would have long-term impacts for the duration of the project. The loss of forage available for grazing on 630 acres of BLM land within the mine area would be small and amounts to approximately 5 percent of the total Copper Flat Ranch allotment (630/12,338); a reduction in permitted AUMs and authorized animal units is not anticipated for the same reasons as described for the Proposed Action. The impact to forage and grazing allotments for construction of the utility infrastructure and millsites would be the same as the Proposed Action.

The proposed electrical substation would disturb 30 acres of State Trust land within the South Kelly Canyon allotment. There are 1,920 acres of State Trust land included in the 13,445 total acres within this allotment. The loss of forage available for grazing on 30 acres would be negligible and not likely require an adjustment of AUMs permitted for the State Trust land.

Drawdown of the groundwater in the deep aquifer along Las Animas Creek near the water well sites would be greater due to a larger area where drawdown would exceed 10 feet. However, the drawdown from the shallow alluvium would be negligible compared to the overall depth of the evapotranspiration layer of the alluvial groundwater so that no change to riparian plant community vigor and composition is expected, and any grazing use of areas outside the mine area but within the drawdown contours would not be affected.

Mine closure and reclamation impacts to grazing use would also be similar to the Proposed Action.

3.19.2.4 No Action Alternative

There would be no new surface disturbance within and surrounding the mine area under the No Action Alternative that would result in a loss of available forage for livestock use. Existing vegetation communities would be expected to continue to survive. Any changes to permitted AUM use within the allotments would be due to rangeland conditions and livestock management.

3.19.3 Mitigation Measures

The proposed mine area would be fenced to prevent injury or loss of livestock from mining operations. The location of the boundary fence would maintain connectivity for livestock movement throughout the Copper Flat Ranch allotment. Health and safety training of mine workers would include the provision of information on livestock open range and operation of vehicles to minimize the risk of collisions with livestock.

3.20 TRANSPORTATION AND TRAFFIC

3.20.1 Affected Environment

3.20.1.1 Traffic Capacity

The evaluation of existing roadway conditions focuses on capacity, which reflects the ability of the network to serve the traffic demand and volume. The capacity of a roadway depends mainly on the street width, number of lanes, intersection control, and other physical factors. Traffic volumes are typically reported, depending on the project and database available, as the daily number of vehicular movements in both directions on a segment of roadway, averaged over 1 full calendar year (average annual daily traffic [AADT]), or averaged over a period of less than 1 year (average daily traffic [ADT]), and the number of vehicular movements on a road segment during the peak hour. These values are useful indicators in determining the extent to which the roadway segment is used and in assessing the potential for congestion and other problems (ITE 1998).

The performance of a roadway segment is generally expressed in terms of the level of service (LOS). The LOS scale ranges from A to F with each level defined by a range of volume to capacity ratios. LOS A, B, and C are considered good operating conditions where minor to tolerable delays are experienced by motorists. LOS D represents below average conditions. LOS E corresponds to the maximum capacity of the roadway. LOS F represents a jammed situation. The LOS designations and their associated volume to capacity ratios for freeways and multi-lane and two-lane arterial roadways are presented below. (See Table 3-36.)

Table 3-36. Primary Highway Level of Service Criteria

Table 3-36. Primary Highway Level of Service Criteria				
		Criteria: Volume/Capacity (v/c)		
LOS	Description	Freeway	Multi-Lane Arterial	Two-Lane Arterial
A	Free flow with users unaffected by the presence of other users of the roadway.	0-0.24	0-0.33	0-0.09
B	Stable flow, but presence of the users in traffic stream becomes noticeable.	0.25-0.39	0.34-0.55	0.10-0.21
C	Stable flow, but operation of single users becomes affected by interactions with others in traffic stream.	0.40-0.59	0.56-0.75	0.22-0.36
D	High density, but stable flow; speed and freedom of movement are severely restricted; poor levels of comfort and convenience.	0.59-0.78	0.76-0.89	0.37-0.60
E	Unstable flow; operating conditions at capacity with reduced speeds, maneuvering difficulty, and extremely poor levels of comfort and convenience.	0.79-1.00	0.90-1.00	0.61-1.00
F	Forced or breakdown flow with traffic demand exceeding capacity; unstable stop and go traffic.	>1.00	>1.00	>1.00

Source: TRB 1994.

For rural, gravel roads the LOS computations are more problematic. Terrain plays a major part in the LOS of rural roadways and is a greater factor there than for freeways and arterial roadways. The LOS used for this analysis utilizes the Highway Capacity Manual guidance of the Transportation Research Board, and standards applied for many states. (See Table 3-37.)

Table 3-37. Rural Two-Lane Uninterrupted LOS

Table 3-37. Rural Two-Lane Uninterrupted LOS					
	LOS for Level Terrain				
Road Type	**A**	**B**	**C**	**D**	**E**
Secondary	316	545	869	1,398	2,208
Light duty paved	177	292	464	820	1,519
Light duty gravel	89	146	232	410	760

Source: FDOT 1998.

Finally, sight lines are included in the assessment for LOS because any material degradation of a driver's line-of-sight will significantly affect the driver's ability to see and respond to traffic issues.

New Mexico has established minimum acceptable LOS standards, which can be applied to NM-140 and NM-152. (See Table 3-38.)

Table 3-38. Minimum Acceptable Level of Service Standards

Table 3-38. Minimum Acceptable Level of Service Standards						
	LOS					
Type of Roads*	**UPA**	**UMA**	**UCOL**	**RPA****	**RMA****	**RCOL**
Two-Lane Highways	D	D	C	C	C	B

Source: NMDOT 2001.

Notes: * UPA: Urban Principal Arterial; UMA: Urban Minor Arterial; UCOL: Urban Collector Street.
RPA: Rural Principal Arterial; RMA: Rural Minor Arterial; RCOL: Rural Collector Street .
** applies to NM-140 & NM-152.

3.20.1.2 Highway Condition

Roadway condition is analyzed in order to determine the potential degradation of the highway. Increased traffic and the use of haul trucks over highways may not be stressed for long-term use by vehicles of this type is of particular concern. Pavement Condition Index (PCI) will be used to predict life expectancy of the roadway, if data is available. PCI is a numerical indicator that rates the surface condition of the pavement (ASTM D6433-09 Standard Practice for Roads and Parking Lots Pavement Condition Index). The range is 0 to 100. A PCI rating of 40 or less is classified as a pavement in poor condition and a rating of 85 or more is classified as a pavement in excellent condition. Using this protocol along with bore samples of the roadways, and projecting Equivalent Single Axel Loads (ESALs) traveling the roadway, an estimate of the life expectancy of the roadway can be projected using the 1993 American Association of State Highway and Transportation Officials (AASHTO) Pavement Design Guide (AMEC 2012).

The major travel lane analyzed in this assessment starts with the access route to the entrance of the mine area, which is by 3 miles of an all-weather gravel road (Gold Mine Road). Gold Mine Road intersects an east-west paved highway, NM-152 east to I-25, near Caballo Reservoir. The 10 miles on NM-152 to I-25 is mainly a straight and relatively flat road that does not include any sharp turns or significantly adverse grades. From that point, the route travels both North along I-25 to Truth or Consequences or south to Rincon, New Mexico.

The area analyzed in this section centers on the entrance to the mine and the various transportation avenues in the area. Employees are expected to primarily reside in Truth or Consequences and travel here south along I-25 to NM-152 and from there to Gold Mine Road to the mine entrance. Product from the mine would be trucked east on Gold Mine Road, NM-152 to I-25, then south to a rail spur located just off of the Rincon/NM-140 (Exit #35). There are no rail, air, or public transportation venues available for transport along this route.

Peak hour traffic data, for NM-152 and NM-140, was estimated using 2013 New Mexico Department of Transportation (NMDOT) Transportation Information Management System (TIMS) database AADT volumes. It indicates a current AADT of approximately 421 vehicles near the entrance to the mine (Mile Post (MP) 55.01) on NM-152, and approximately 1,073 vehicles near the rail spur in Rincon (approximately Mile Post (MP) 2.5) on NM-140 (NMDOT 2014). There are no vehicle counts for gold Mine Road but the Sierra County Road Department Superintendent estimates there are five to ten vehicle trips along the road per day (Gustin 2014).

3.20.1.3 Traffic Capacity

Operational traffic analysis, the level of performance of roadways and intersections, requires peak hour traffic volumes. The peak hour volumes were estimated from the daily traffic volumes by applying the "10 percent (%) rule," a rule of thumb that estimates peak hour volumes as 10% of the daily traffic volumes. This formed the initial estimate of peak hour volumes.

I-25 Interchange and NM-152 Corridor: Due to the very low daily volume, with just 421 vehicles per day (NMDOT 2014) on NM-152 within the study area, the peak hour volumes were increased above the 10% rule. For NM-152, the traffic volumes were doubled over the 10% rule, and at the I-25 on- and off-ramps, the volume was tripled at each intersection. Therefore, the results reported here are conservative, because the analysis considered traffic volumes well above what is likely to be present at the intersections. The movements from the interchange and along the corridor operate at LOS A (HighPlan 2012). (See Table 3-37.) This LOS indicates an excellent operational performance and minimal congestion.

I-25 Interchange to Railroad Spur Along NM-140: During operation, material from the mine (copper concentrate) is expected to be hauled by truck to a rail spur in Rincon via I-25 and NM-140 (exit #35). Existing peak hour traffic data was estimated using 2013 NMDOT TIMS AADT volumes for NM-140. Approximately 1,073 vehicles (NMDOT 2014) utilize the entrance to the rail spur (approximately MP 2.5 on NM-140). The 10% rule for peak hour traffic, as described above for NM-152 Interchange, was used to estimate the peak hour traffic for the NM-140 interchange.

The entrance to the rail spur is an open driveway and there is no curb and gutter, nor a defined entrance. However, it appears there are several locations along NM-140 where trucks typically enter and exit the rail spur vicinity. Therefore, this analysis is just an approximation of existing traffic operations.

The analysis assumed the driveway was across from an existing intersection and was analyzed as a four-legged intersection. Estimates of side street and rail spur driveway traffic included 15 vehicles access NM-140 from both the street and driveway. Based on observation of the number of homes served by the minor streets in the area this number is considered conservative.

Movements along this route operate at LOS A (HighPlan 2012). (See Table 3-37.) This indicates an excellent operational performance and minimal congestion.

Gold Mine Road: There is no traffic count data for Gold Mine Road, but the Superintendent of the Sierra County Road Department estimates the traffic along this road at five to ten vehicles per day (Gustin 2014). This low level of traffic would suggest a LOS of A. The traffic LOS for all three routes, all well within the New Mexico minimum standards, is depicted in the following table. (See Table 3-39.)

Table 3-39. Existing Conditions Level of Service

Table 3-39. Existing Conditions Level of Service	
Highway Segment	**LOS**
NM-152 corridor (I-25 intersection to mine entrance)	A
NM-140 corridor (I-25 intersection to RR spur)	A
Gold Mine Road	A

Note: Computations derived from HighPlan 2012.

3.20.1.4 Sight Lines

The only area of concern with regard to sight distance is located just east of the mine entrance (MP 55.01) and involves the viewshed while traveling east on NM-152. There is some existing foliage along the inside radius. There are no issues with sight lines on either NM-140 or Gold Mine Road.

3.20.1.5 Highway Condition

NM-152 Corridor: The PCI for NM-152 was determined to be 93, or a "pavement in excellent condition." The roadway surface is a chip seal that has minor transverse and longitudinal cracking, reveling and bleeding. The roadway generally did not have paved shoulders. Where there were turnouts, paved shoulders were provided. In areas where there was not a paved shoulder there was an edge drop off of 1.5 to 2.5 inches (AMEC 2012).

At MP 55 and 62, borings were made to obtain the thickness of the layers of the asphalt pavement and to obtain samples of the subgrade for subsequent testing. At MP 55 the thickness is about 4.5 inches and at MP 62 it is about 3 inches (AMEC 2012).

Using the information gathered, the life expectancy of the pavement was predicted. (See Table 3-40.)

Table 3-40. Theoretical Pavement Life Expectancy – NM-152

Table 3-40. Theoretical Pavement Life Expectancy - NM-152		
Chip Seal Thickness (Inches)	**ESALs to Failure***	**Life Expectancy (Years)**
3.00	190,000	26
3.75	400,000	54
4.50	660,000	90

Source: AMEC 2012.

Note: * 7,300 ESALs per year ESAL: Equivalent Single Axel Load.

NM-140 Corridor: The PCI for NM-140 was determined to be 52, or a "pavement in fair condition." The roadway surface is asphalt concreter pavement that shows signs of age deterioration in the form of extensive transverse and longitudinal cracking. No signs of structural stress were noted (AMEC 2012). Bore samplings were not taken of NM-140 so life expectancy of the highway cannot be predicted as with NM-152.

Gold Mine Road: Gold Mine Road, which accesses the mine entrance directly from NM-152, is a gravel two-lane road. The Sierra County Road Department supervisor stated that the road is essentially the same road used by the Quintana Mining Company when the mine was in operation in the 1980s. He indicated that the road was maintained quarterly; maintenance consisted of re-grading as necessary (Gustin 2014). There is no information currently available as to the PCI for the road or its general condition.

3.20.2 Environmental Effects

Transportation and traffic impacts are discussed in this section by comparing the current and anticipated future LOS for the project area and where sight line degradation could affect LOS. Highway or roadway degradation could also significantly impact the expeditious flow of traffic and that topic is addressed.

The following criterion was used as the basis for evaluating the potential significance of impacts associated with transportation and traffic:

> *A significant impact to transportation resources would be a traffic increase, which is predicted to upset the normal flow of traffic, create the need for major road repair as a result of the action, or generate traffic levels requiring the expansion of existing roadways or facilities* (TRB 1994).

The potential impacts from the proposed copper mine on transportation and traffic are:

- Creation of traffic congestion;
- Change to LOS on County/State roads and highways;
- Increase in risk of vehicular accidents on public roads;
- Traffic delays caused by construction activities; and
- Change in roadway maintenance due to increase highway utilization.

3.20.2.1 Proposed Action

3.20.2.1.1 Mine Development/Operation

The Proposed Action calls for 400-600 personnel to be hired for construction related activities, and 250 personnel for operation of the mine including administration. Vendors, equipment, and service suppliers are anticipated to take, in total, an average of 10 to 15 trips per day by truck to the mine. Copper concentrate shipment, in years 1-5, would require 10-14 truckloads per day, 4 days per week. For years six to the end of the mining operation, there would be six to ten truckloads per day, 4 days per week. Molybdenum concentrate shipment would require two truckloads per month for the life of the mine. These trucks would go east on NM-152 to I-25, then south to a rail spur located just off of the Rincon/NM-140 intersection (Exit #35). Shipment of concentrate would generally be via hydraulic dump trucks with 25-ton capacity towing 10-ton trailers.

Traffic Capacity: Normal automobile traffic associated with the mine would not follow standard traffic guidelines. For access to the mine (NM-152 and Gold Mine Road), the additional traffic would not be spaced out over the course of the normal day but would primarily be concentrated during shift changes during construction or mine operations. So "peak hour" volumes, if applied in this analysis, would not provide a true view of potential highway capacity impacts. Unlike the "three person per carpool" rule, this analysis will follow the following guidelines:

- Construction assumes maximum of 600 employees carpool (2 per car) and 1 shift;
- Operations assume no carpooling and 250 employees;
- Operations have two shift changes;

- Operations day shift will include all administrative personnel;
- Operations assume maximum of 15 vendors/visitors per day (9AM – 5PM); and
- Operations assume all vendor/visitor trips are trucks.

During construction, the LOS for NM-152 would go from A to B. NM-140 would not be affected by the construction phase. During operation of the mine, the LOS for NM-152 would increase to B and the LOS for NM-140 would remain at A.

Of greater concern would be the effect of introducing this proposed level of activity on Gold Mine Road, a gravel-surfaced rural roadway. The peak hour LOS for construction would be C and for operations would be B. This continued level of automobile and heavy truck traffic over time along the route would cause rutting and surface degradation, causing the LOS to get appreciably worse. The Sierra County Superintendent of Roads stated this level of traffic would destroy the roadway (Gustin 2014). NMCC is in the process of developing a MOU with NMDOT to address requirements for the use of NM-152 during mine construction and operation. NMDOT has requested and NMCC has agreed to certain pavement improvements on that stretch of the highway prior to NMDOT's issuance of the access permit for the existing main access point to the mine. The MOU will provide documentation of this commitment. It is NMCC's intent that the MOU will be in place prior to the beginning of the plant construction and operation.

LOS A, B, or C are considered good operating conditions where minor to tolerable delays may be experienced by motorists. Thus, there would be minimal impact to highway capacity under the Proposed Action for NM-152 and NM-140. Impacts to the LOS for Gold Mine Road, with time, would be major and potentially significant. Initial results are reflected below. (See Table 3-41.)

Table 3-41. Level of Service for Proposed Action

Table 3-41. Level of Service for Proposed Action		
Highway Segment	**LOS**	
	Construction	**Operations**
NM-152 corridor (I-25 intersection to mine entrance)	B	B
NM-140 corridor (I-25 intersection to RR spur)	N/A	A
Gold Mine Road	C	B

Sight Lines: The Proposed Action would not affect the sight lines of the routes in question. As stated in the affected environment section, the only area of concern with regard to sight distance is located just east of the mine entrance (MP 55.01) and involves the viewshed while traveling east on NM-152. The existing foliage along the inside radius would need to be maintained to ensure clear visibility along this curve at all times. Impacts would be negligible.

Highway Condition: Using the information gathered, the life expectancy of the pavement was predicted. (See Table 3-42.)

Table 3-42. Theoretical Pavement Life Expectancy – NM-152

Table 3-42. Theoretical Pavement Life Expectancy - NM-152			
Chip Seal Thickness (Inches)	ESALs to Failure	Life Expectancy* (Years)	Proposed Action Life Expectancy** (Years)
3.00	190,000	26	12
3.75	400,000	54	26
4.50	660,000	90	42

Notes: * 7,300 ESALs per year.
** 15,871 ESALs per year.

The increased traffic plus the addition of the haul trucks to the traffic stream on NM-152 would reduce the structural life of the pavement by approximately 53 percent. It is unknown at this time what the impact would be to NM-140, but the condition of the existing surface would indicate that the structural life would be short-lived and the impact would be considered major.

Of greater concern is the effect of introducing this level of activity on Gold Mine Road, gravel surfaced rural roadway. The Sierra County Road Superintendent, when presented with the numbers of vehicle trips along Gold Mine road stated, "That level of heavy traffic would destroy the roadway" (Gustin, 2014). There is no data available to counter the Supervisor's assessment, so the impact would be major and significant.

3.20.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Alternative 1 calls for 400-600 personnel to be hired for construction related activities, and 265 personnel for operation of the mine including administration. Vendors, equipment, and service suppliers are anticipated to take, in total, an average of 10 to 15 trips per day by truck to the mine. Copper concentrate shipment, in years 1-5, would require 12-16 truckloads per day, 5 days per week. For years 6 to the end of the mining operation, there would be 8-12 truckloads per day, 5 days per week. Molybdenum concentrate shipment would require three truckloads per month for the life of the mine. As with the Proposed Action, these trucks would go east on NM-152 to I-25, then south to a rail spur located just off of the Rincon/NM-140 intersection (Exit #35). Shipments of concentrate would generally be via hydraulic dump trucks with 25-ton capacity towing 10-ton trailers.

Traffic Capacity: Normal automobile traffic associated with the mine would be the same as the Proposed Action. The LOS during construction and operations would be the same and the activities on Gold Mine Road would also be the same. As a result, there would be minimal impact to highway capacity under Alternative 1. Impacts to LOS for Gold Mine Road, with time, would be major and potentially significant. Results are reflected below. (See Table 3-43.)

Table 3-43. Level of Service for Alternative 1

Table 3-43. Level of Service for Alternative 1		
Highway Segment	LOS	
	Construction	Operations
NM-152 corridor (I-25 intersection to mine entrance)	B	C
NM-140 corridor (I-25 intersection to RR spur)	N/A	A
Gold Mine Road	C	B

Sight Lines: Activities associated with Alternative 1 would not affect the sight lines of the routes in question. The impacts would be the same as with the Proposed Action.

Highway Condition: Using the information gathered, the life expectancy of the pavement was predicted. (See Table 3-44.)

Table 3-44. Theoretical Pavement Life Expectancy – NM-152 – Alternative 1

Table 3-44. Theoretical Pavement Life Expectancy - NM-152 – Alternative 1			
Chip Seal Thickness (Inches)	ESALs to Failure	Life Expectancy* (Years)	Life Expectancy** (Years)
3.00	190,000	26	9
3.75	400,000	54	19
4.50	660,000	90	31

Notes: * 7,300 ESALs per year.
** 20,978 ESALs per year.

The result of the addition of the increased traffic plus the haul trucks to the traffic stream on NM-152 would reduce the structural life of the pavement by 65 percent. It is unknown at this time what the impact would be to NM-140 but the condition of the existing surface would indicate the structural life would be short lived. The impacts associated with Gold Mine Road would be the same as with the Proposed Action.

3.20.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

As under the Proposed Action and Alternative 1, Alternative 2 calls for 400-600 personnel for construction related activities, and 270 personnel for the operation of the mine including administration. Vendors, equipment, and service suppliers are anticipated to take, in total, an average of 10 to 15 trips per day by truck to the mine. Copper concentrate shipment would require 14-19 truckloads per day and molybdenum concentrate shipment would require three truckloads per month for the life of the mine. As with the Proposed Action and Alternative 1, these trucks would go east on NM-152 to I-25, then south to a rail spur located just off of the Rincon/NM-140 intersection (Exit #35). Shipments of concentrate would generally be via hydraulic dump trucks with 25-ton capacity towing 10-ton trailers.

Traffic Capacity: Normal automobile traffic associated with the mine would be the same as with the Proposed Action and Alternative 1. The LOS during construction and operations would be the same and the activities on Gold Mine Road would also be the same. As a result, there would be minimal impact to highway capacity for Alternative 2 for NM-152 and NM-140. Impacts to LOS for Gold Mine Road, with time, would be major and potentially significant. Initial results are the same as those shown for Alternative 1. (See Table 3-43.)

Sight Lines: Activities associated with Alternative 2 would not affect the sight lines of the routes in question. The impacts would be the same as with the Proposed Action and Alternative 1.

Highway Condition: The life expectancy of the pavement is shown below. (See Table 3-45.)

Table 3-45. Theoretical Pavement Life Expectancy – NM-152 – Alternative 2

Table 3-45. Theoretical Pavement Life Expectancy – NM-152 – Alternative 2			
Chip Seal Thickness (Inches)	**ESALs to Failure**	**Life Expectancy* (Years)**	**Life Expectancy** (Years)**
3.00	190,000	26	7
3.75	400,000	54	16
4.50	660,000	90	26

Notes: * 7,300 ESALs per year.
** 25,762 ESALs per year.

The increased traffic that would occur under Alternative 2, plus the addition of haul trucks to the traffic stream on NM-152, would reduce the structural life of the pavement by approximately 70 percent. It is unknown at this time what the impact would be to NM-140, but the condition of the existing surface would indicate that the structural life would be short-lived. The impacts associated with Gold mine Road would be the same as with the Proposed Action and Alternative 1.

3.20.2.4 No Action Alternative

No adverse impacts on local transportation and traffic patterns would be expected to result from continuation of existing operations under the No Action Alternative. Additionally, there would be no impacts associated with highway condition with the No Action Alternative.

3.20.3 Mitigation Measures

No mitigation measures for transportation and traffic beyond regulatory requirements described in the Proposed Action have been identified for any alternative.

3.21 NOISE AND VIBRATIONS

3.21.1 Affected Environment

3.21.1.1 Noise Overview

Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air, and are sensed by the human ear. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise distance between the noise source and the receptor, receptor sensitivity, and time of day. Noise is often generated by activities essential to a community's quality of life, such as heavy equipment or vehicular traffic.

Sound varies by both intensity and frequency. Sound pressure level, described in decibels (dB), is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz are used to quantify sound frequency. The human ear responds differently to different frequencies. "A-weighing", measured in A-weighted decibels (dBA), approximates a frequency response expressing the perception of sound by humans. Sounds encountered in daily life and their dBA levels are shown below. (See Table 3-46.)

Table 3-46. Common Sounds and Their Levels

Table 3-46. Common Sounds and Their Levels		
Outdoor	**Sound level (dBA)**	**Indoor**
Motorcycle	100	Subway train
Tractor	90	Garbage disposal
Noisy restaurant	85	Blender
Downtown (large city)	80	Ringing telephone
Freeway traffic	70	TV audio
Normal conversation	60	Sewing machine
Rainfall	50	Refrigerator
Quiet residential area	40	Library

Source: Harris 1998.

The dBA noise metric describes steady noise levels, although very few noises are, in fact, constant. Therefore, A-weighted Day-night Sound Level has been developed. Day-night Sound Level (DNL) is defined as the average sound energy in a 24-hour period with a 10-dB penalty added to the nighttime levels (10 p.m. to 7 a.m.). DNL is a useful descriptor for noise because: 1) it averages ongoing yet intermittent noise, and 2) it measures total sound energy over a 24-hour period. In addition, Equivalent Sound Level (Leq) is often used to describe the overall noise environment. Leq is the average sound level in dB.

The Noise Control Act of 1972 (PL 92-574) directs Federal agencies to comply with applicable Federal, State, and local noise control regulations. In 1974, the USEPA provided information suggesting continuous and long-term noise levels in excess of DNL 65 dBA are normally unacceptable for noise-sensitive land uses such as residences, schools, churches, and hospitals. Neither the State of New Mexico nor Sierra County have noise ordinances.

3.21.1.2 Existing Noise

Existing sources of noise near the proposed Copper Flat project include light traffic, high-altitude aircraft overflights, and natural noises such as wind gusts and animal and bird vocalizations. The areas surrounding the site can be categorized as rural or remote. There are no nearby noise-sensitive receptors (churches, schools, hospitals, or residences) in the immediate vicinity of the proposed Copper Flat project. Existing noise levels (DNL and Leq) were estimated for the areas associated with the proposed Copper Flat project using the techniques specified in the *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound Part 3: Short-term Measurements with an Observer Present* (ANSI 2013). (See Table 3-47.)

Table 3-47. Closest Noise-Sensitive Areas

Table 3-47. Closest Noise-Sensitive Areas

			Estimated Existing Sound Levels (dBA)			
Description	**Approximate Distance from Project**	**Type**	**Land Use Category**	**DNL**	**L_{eq} (daytime)**	**L_{eq} (nighttime)**
Hillsboro	3.5 miles	Residential	Very Quiet Suburban and Rural Residential	42	40	34
Residence	0.5 miles					

Source: ANSI 2013.

3.21.1.3 Vibration

Groundborne vibrations were evaluated using peak particle velocity (PPV) and the OSM vibration criteria. PPV is the maximum instantaneous [peak] level of a vibration wave, and is normally measured in inches per second. OSM thresholds vary according to the repetition pattern of vibration events, human response versus cosmetic building damage potential, and type of building for the onset of structural damage. As outlined in Section 3.13, Cultural Resources, several historic structures exist in or near the proposed mine area. Because of the remote location and lack of existing activity, there is no perceptible vibration at the site. Existing levels of vibration at the site are expected to be less than 0.04 inches per second, and appreciably below levels with the proposed project (Bureau of Mines 1980; Caltrans 2004).

3.21.2 Environmental Effects

3.21.2.1 Proposed Action

Short- and medium-term minor adverse effects would be expected under the Proposed Action. Short-term effects would be limited to heavy equipment noise during site preparation and reclamation, while medium-term effects would be due to blasting during mineral extraction, use of rock crushers, and operation of heavy equipment during mine operations. The Proposed Action would not contribute to a violation of any State, Federal, or local noise or vibration regulation.

3.21.2.1.1 Noise from Mine Development and Operation

Noise produced during mine development would primarily be generated during soil stripping and construction of the TSF concentrator and primary crushing facility. Operational noise would be primarily from rock crushing, diesel transport trucks, intermittent generator use, and blasting.

Heavy equipment would be used for mine development and operation and would have varying noise levels at 50 feet. (See Table 3-48.) With multiple items of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within several hundred feet of heavy equipment operation and drilling sites. The zone of relatively high equipment noise typically extends to distances of 800 feet from the site of major operations.

Table 3-48. Noise Levels Associated with Heavy Equipment

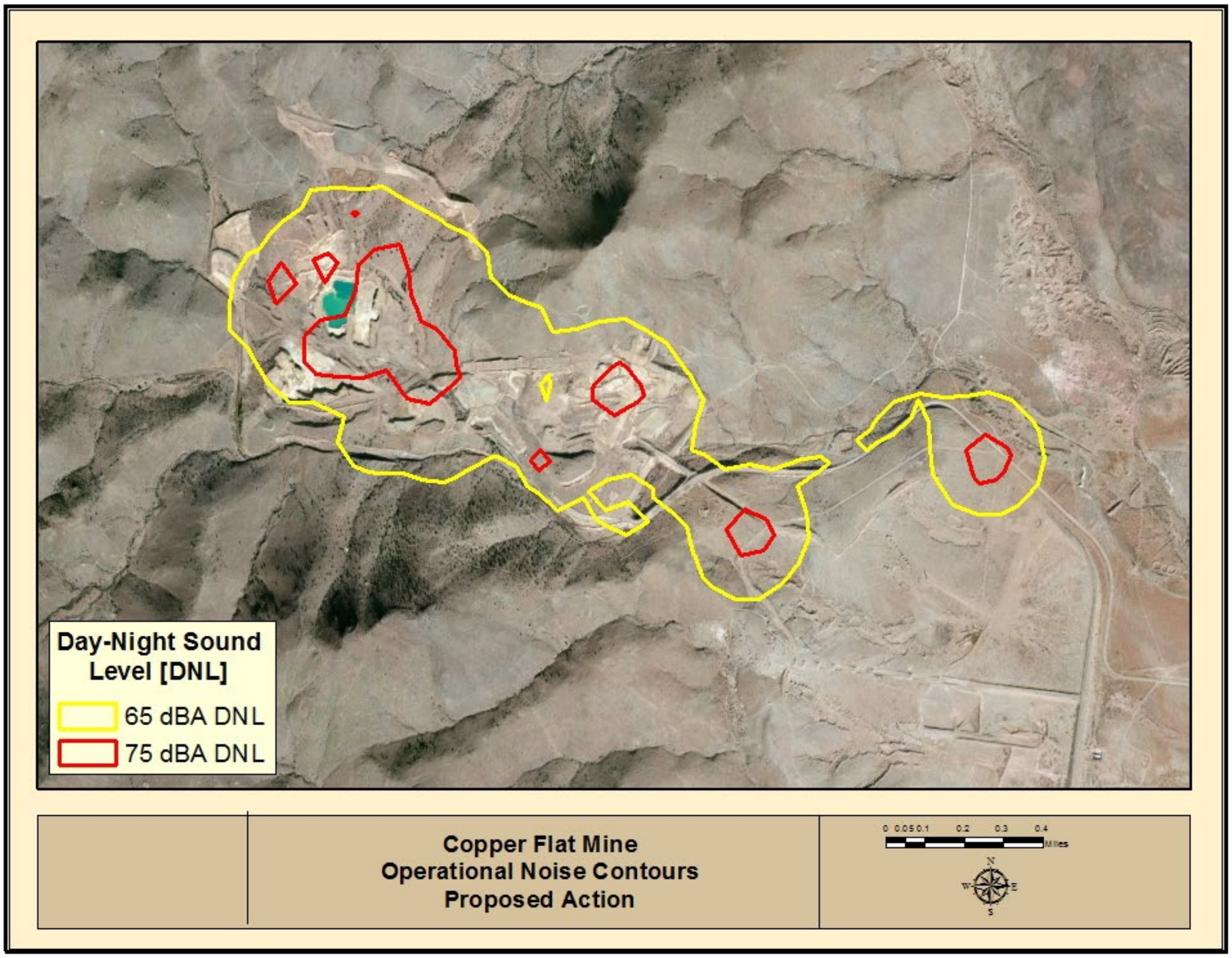
Table 3-48. Noise Levels Associated with Heavy Equipment	
Equipment	**L_{eq} (dBA) at 50 feet from Source**
Rock crusher	90[1]
Hydraulic shovels	82
Loader/dozer/grader	85
Backhoe	80
Grader	85
Crane	88
Drill rigs	98
Generator	81

Source: FHWA 2012; USFA 2004.

Note: [1] Measured at a distance of 100 feet from the source.

SoundPlan 2.0 noise model was used to estimate noise levels surrounding the proposed mining activities. SoundPlan takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, and reflections from surfaces. The ISO 9613 standard *Acoustics -- Attenuation of Sound During Propagation Outdoors* was used in the assessment (ISO 1989). No credit was taken for absorptive ground cover or intervening foliage – factors that would otherwise act to reduce sound levels. Notably, the mine itself would be in a depressed topographical area and surrounded by natural berms which act as sound barriers. Areas that are likely to have a DNL above 65 dBA during operation under the Proposed Action are shown below. (See Figure 3-46.) These contours display the sound levels of heavy equipment, crusher, and trucks associated with operations. Areas with DNL above 65 dBA are within the proposed mine area. The area is remote and approximately 4 miles from the nearest town. Normal operation of the mine would not create noise that was incompatible with surrounding land uses.

Figure 3-46. Estimated Noise from the Proposed Action



Source: LPES, Inc. 2014.

Noise from Blasting: Blasting noise would be intermittent and greatest during initial phases; noise would decrease as mining activities progress. Although operations would take place 24 hours per day, blasting would be limited to daylight hours. Drill patterns would range from 60 to 120 blast holes, and a typical hole would contain approximately 175 pounds of ANFO (140 pounds of TNT equivalent). Typically, there would be 10 to 20 milliseconds of delay between each blast hole, and each blasting event would last between 1 to 2 seconds.

Noise generated from the use of explosives is a common cause of complaint among people near surface mining operations. As mentioned above, land use compatibility due to steady-state noise is typically assessed by averaging noise levels over a protracted period. This approach can be misleading because it does not assess community noise effects due to relatively infrequent, yet loud, impulsive noise events. For example, for a surface mining operation at which several hundred charges are detonated each year, peak pressure levels can exceed 140 dB in areas where annual DNL values indicate that noise is recommended for residential land use. The peak noise levels provide the absolute maximum sound level for an individual acoustical event, not an average over several events or over a period of time like the DNL. Although not a good descriptor of the overall noise environment like the DNL, peak levels relate well to the level of concern and possibility of complaints among people living nearby after an individual blast event. Level of concern guidelines that use peak noise levels exist for impulsive noise and the distances these effects would take place after a blasting event. (See Table 3-49.)

Table 3-49. Risk of Noise Concern and Complaints from Blasting

Risk of Noise Concern	Peak Noise Levels	Critical Distance (feet)
Low	< 115 dBP	> 2,344 feet
Medium	115–130 dBP	556 - 2,344 feet
High	130 - 140dBP	< 556 feet

Source: Siskind 1989; U.S. Army 2007; Caltrans 2004.

During each event, the 130-dBP peak noise levels would extend 556 feet from the point of detonation. This area of high concern and complaint would remain entirely within the mine area, and no nearby NSAs would be exposed to these levels of noise. The 115-dBP peak noise levels would extend 2,344 feet from the point of detonation. The level of concern and complaints associated with individual acoustical events would be moderate within this area. Although this area of moderate concern and complaint may extend beyond the mine area, there are no residences within this distance. Depending on meteorological conditions, blasting activities may be heard by residences and others as much as several miles from the site. However, these events would best be characterized as "audible but distant" and would not be appreciably intrusive. Due to the limited frequency of the loud acoustical events and the distance to the nearest nearby residents, these effects would be minor.

Noise from Vehicles: Vehicular traffic would increase due to employees commuting to and from the site, haul trucks, and vendor vehicles. Additional temporary increases in vehicular traffic along NM-152 would result from the mine development workers for approximately 12-18 months prior to operations. Vehicle trips would increase at peak periods due to scheduled shift changes. Vehicles used for the Copper Flat project would be well maintained and meet the Federal, State, and local safety requirements. Trucks with properly operating mufflers would be expected to generate up to an estimated 86 dBA at 50 feet. Haul road truck noise would be within the acceptable level based on existing conditions. Given the remote location, presence of topographical barriers that serve to shield distant noise sources, and distance of receptors, these effects would be negligible.

Occupational Health and Safety: Heavy equipment noise would dominate the soundscape for all on-site personnel. Copper Flat project personnel, particularly equipment operators, would wear adequate personal hearing protection to limit exposure and ensure compliance with Federal health and safety regulations.

3.21.2.1.2 Vibrations from Mine Development and Operation

During mining activities, vibration effects may occur from the use of heavy equipment such as general earth moving equipment, drills, and blasting. Buildings and their occupants near these types of activities would respond to vibrations with varying results, ranging from barely perceptible at low levels, distinctly perceptible at moderate levels, and possible structural damage at the highest levels. The effects of groundborne vibration include perceptible movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Building damage is not normally a factor for most projects, with the occasional exception of blasting, pile driving, and demolition of structures. For locations close to these activities, plaster cracking and window breaking sometimes occurs.

Groundborne vibrations associated with heavy equipment and blasting activities were evaluated using OSM vibration criteria. PPV and critical distances at which the construction vibration would exceed human response and the threshold for structural damage were estimated. (See Table 3-50.) Groundborne vibration associated with general heavy equipment (i.e., non-impact) would be perceptible to humans and begin to cause cosmetic damage to historic structures at a distance substantially less than those of blasting. Notably, decay factors for ground borne vibrations can vary greatly based on site-specific features such as soil and rock types, and topography. The numbers provided below are estimates based on the best currently available information and were carried forward to characterize the types and overall level of effects under NEPA. If additional refinements were required, on-site monitoring during operations would be necessary to verify estimates contained herein.

Table 3-50. Critical Distance for Human Response and Structural Damage from Vibration

Table 3-50. Critical Distance for Human Response and Structural Damage from Vibration				
Human Response Thresholds				
		Critical Distance (feet)		
Human Response	**Peak Particle Velocity (inches/second)**	**General Heavy Equipment**	**Drilling**	**Blasting**
Barely perceptible	0.04	113	315	1,573
Distinctly perceptible	0.25	21	60	500
Strongly perceptible; may be annoying to some people in buildings	0.9	7	19	225
Severe; unpleasant for people in buildings; unacceptable to pedestrians on bridges	2	3	9	136
Structural Damage Thresholds				
		Critical Distance (feet)		
Structure and Condition	**Peak Particle Velocity (inches/second)**	**General Heavy Equipment**	**Drilling**	**Blasting**
Extremely fragile historic buildings, ruins, and ancient monuments	0.12	42	116	792
Fragile buildings	0.2	26	73	575
Historic and some old buildings	0.5	11	32	324
Older residential structures	0.5	11	32	324
Newer residential structures	1	6	17	210
Modern commercial/industrial buildings	2	3	9	136

Source: Siskind 1989; Bureau of Mines 1980; Caltrans 2004.

Groundborne vibration associated with blasting would be distinctly perceptible at a distance of 500 feet and barely perceptible at 1,573 feet. There are several historic structures in or near the proposed mine area. Blasting activities within 792 feet, drilling activities within 116 feet, and general heavy equipment activities within 42 feet could cause minor cosmetic damage to extremely fragile historic buildings. Blasting activities within 324 feet, drilling activities within 32 feet, and general heavy equipment activities within 11 feet could cause minor cosmetic damage to older structures and historic buildings. A detailed discussion of the potential for direct effects on specific historic structures is outlined in Section 3.13, Cultural Resources.

3.21.2.1.3 Noise and Vibrations from Mine Closure/Reclamation

Short-term adverse effects would be expected. Noise and vibrations during the mine closure and reclamation would be similar in nature to that of the use of heavy equipment during site development and operations. Effects would be due to heavy equipment use during removal of equipment and facilities, and restructuring topography and disturbed areas. Notably, no drilling or blasting would take place, and there would be no effects from these sources. Mine closure and reclamation activities would not exceed or contribute to a violation of any State, Federal, or local noise or vibration regulation. These effects would be minor.

3.21.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

Short- and medium-term minor adverse effects would be expected from Alternative 1. The effects from mine development, operation, closure, and reclamation would be similar in nature, but somewhat greater in level and frequency, than those outlined under the Proposed Action. Short-term effects would be limited to heavy equipment noise during site preparation and reclamation, while medium-term effects would be due to blasting during mineral extraction, use of rock crusher, and heavy equipment during mine operations. Alternative 1 would not contribute to a violation of any State, Federal, or local noise or vibration regulation. (See Table 3-51.)

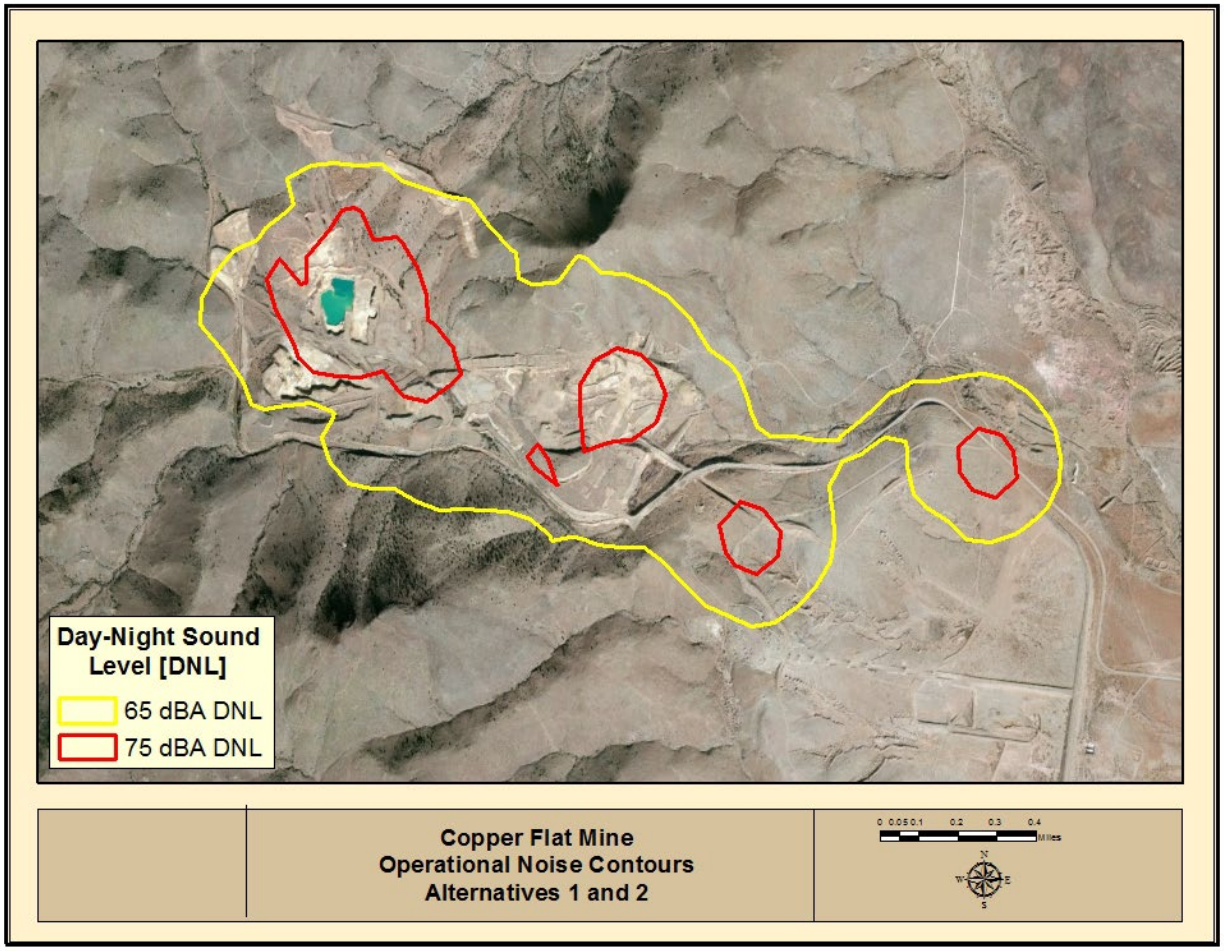
Table 3-51. Noise and Vibration Impacts from Alternative 1

Magnitude	Duration	Extent	Likelihood	Precedence and Uniqueness	Impact Rating
Mine Development/Operations					
Minor	Medium-term, intermittent, or short-term	Small	Probable	Moderate or Slight	Minor
Mine Closure/Reclamation					
Minor	Medium-term or short-term	Small	Probable	Moderate or Slight	Minor
Overall					
Minor	Medium-term, intermittent, or short-term	Small	Probable	Moderate or Slight	Minor

3.21.2.2.1 Noise from Mine Development and Operation

Areas that are likely to have a DNL above 65 dBA under Alternative 1 are shown in Figure 3-47. These contours display the sound levels of heavy equipment, crusher, and trucks associated with accelerated operations. As with the Proposed Action, areas with DNL above 65 dBA would be within the proposed mine area. The area is remote and operation of the mine would not create noise that was incompatible with surrounding land uses.

Figure 3-47. Estimated Noise from Alternatives 1 and 2



Source: LPES, Inc. 2014.

Noise from Blasting: Peak sound levels under Alternative 1 would be identical to those outlined under the Proposed Action, although the number of blasting events would increase appreciably. Level of concern guidelines that use peak noise levels exist for impulsive noise after a blasting event. (See Table 3-49.) There would be a moderate level of concern and complaints within 2,344 feet of blasting activity, which includes areas beyond the mine area; however, there are no residences within this area. Blasting activities may be heard as much as several miles from the site; however, these events would be distant and not appreciably intrusive. Although there would be an increased frequency of blasting events, the site is remote. These effects would be less than significant.

<u>3.21.2.2.2 Vibrations from Mine Development and Operation</u>

The effects from vibration during mine development and operation would be similar in nature and in level as those outlined under the propose action; however, vibrations associated with earth moving equipment, drills, and blasting would be more frequent. Critical distances at which the construction and blasting vibration would exceed human response and the threshold for structural damage would remain unchanged when compared to the Proposed Action. (See Table 3-50.) A detailed discussion of general effects to humans and structures is outlined under the Proposed Action. A detailed discussion of the potential for direct effects on historic structures is outlined in Section 3.13, Cultural Resources. Although there would be an increased frequency of events, the site is remote. These effects would be less than significant.

3.21.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

Short- and medium-term minor adverse effects would be expected from Alternative 2. The effects from mine development, operation, closure, and reclamation would be similar in nature and overall level as those outlined under Alternative 1. It normally takes a doubling in activities to have even a barely perceptible change in the overall noise environment. Therefore, although there would be a 20 percent increase in production, the overall amount of heavy equipment and mining activity would be comparable to Alternative 1. Alternative 2 would not contribute to a violation of any State, Federal, or local noise or vibration regulation. (See Table 3-52.)

Table 3-52. Noise and Vibration Impacts from Alternative 2

Table 3-52. Noise and Vibration Impacts from Alternative 2					
Magnitude	**Duration**	**Extent**	**Likelihood**	**Precedence and Uniqueness**	**Impact Rating**
Mine Development/Operations					
Minor	Medium-term, intermittent, or short-term	Small	Probable	Moderate or Slight	Minor
Mine Closure/Reclamation					
Minor	Medium-term or short-term	Small	Probable	Moderate or Slight	Minor
Overall					
Minor	Medium-term, intermittent, or short-term	Small	Probable	Moderate or Slight	Minor

3.21.2.3.1 Noise from Mine Development and Operation

Figure 3-47 outlines the areas that are likely to have a DNL above 65 dBA under Alternative 2. As with the Proposed Action and Alternative 1, areas with DNLs above 65 dBA would be within the proposed mine area. The area is remote, and operation of the mine would not create noise that was incompatible with surrounding land uses. As with Alternative 1, and for similar reasons, these effects would be less than significant.

Noise from Blasting: The effects from blasting would be similar in nature and overall level as those outlined under Alternative 1. As with Alternative 1 and for similar reasons, these effects would be less than significant.

3.21.2.3.2 Vibrations from Mine Development and Operation

The effects from vibration during mine development and operation would be similar in nature and in level as those outlined under Alternative 1. Critical distances at which the construction and blasting vibration would exceed human response and the threshold for structural damage would remain unchanged. As with Alternative 1 and for similar reasons, these effects would be less than significant.

3.21.2.4 No Action

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action to the noise environment.

3.21.3 Mitigation Measures

Due to the remote location and the overall minor impacts, no mitigation would be required. Although the overall effects would be less than significant, the following BMPs are proposed to minimize the potential for blasting noise and vibration impacts:

- Coordinate with local authorities regarding the movement of oversized loads or heavy equipment;
- Ensure proper hearing protection would be worn at all times;
- Below-grade level rock crushing equipment and production facilities; and
- Notification to nearby townships and residents who may experience blast noise.

3.22 SOCIOECONOMICS

3.22.1 Affected Environment

The analysis of socioeconomic resources identifies aspects of the social and economic environment that are sensitive to changes and that may be affected by the proposal to conduct mining operations for a period of approximately 11 to 16 years. The Proposed Action would consist of construction and operation activities associated with a poly-metallic mine and processing facility at the Copper Flat site. The analysis specifically considers how the proposed and alternative actions might affect the individuals, communities, and the larger social and economic systems of Sierra County, the surrounding region; and the State of New Mexico.

Appendix D of Social Science Considerations in Land Use Planning Decisions of BLM's Land Use Planning Handbook H-1601-1 provides guidance on how social and economic issues and concerns may be incorporated into the planning process. This section evaluates socioeconomic characteristics, including population, employment, housing, community services, and economic systems. Social impacts would be felt most by individuals, communities, residents, and workers in Sierra County. Businesses, community services, and economic systems in Sierra County would likely change the most in response to the implementation of the Proposed Action. Since potential impacts with the greatest magnitude, duration, extent, and likelihood would occur in Sierra County, it is therefore defined as the Region of Influence (ROI) for the analysis of socioeconomic impacts. Impacts that extend outside of the ROI are discussed where applicable throughout the section.

The data supporting this analysis are collected from standard sources, including the U.S. Census Bureau (Census), Bureau of Labor Statistics (BLS), other Federal, State, and local agencies, or other research institutes. Demographic and economic data is presented for Sierra County and compared to demographic and economic data for the State of New Mexico. Demographic data from the Census is also presented for the Hillsboro Census Designated Place (CDP) and the City of Truth or Consequences as applicable. The inclusion of demographic data for the Hillsboro CDP and Truth or Consequences does not change the ROI, since these are located within Sierra County.

3.22.1.1 Population and Housing

3.22.1.1.1 Population

The 2010 estimated population of Truth or Consequences is 6,475, a net decrease of 814 or 11.2 percent from the 2000 estimated population. The State population grew by13.2 percent from 2000-2010. (See Table 3-53.) Sierra County and Truth or Consequences grew negatively by 0.1 percent and 11.2, respectively.

Table 3-53. Population Change, 2000-2010

Table 3-53. Population Change, 2000-2010				
Location	2000	2010	Numeric Change 2000-2010	Percent Change 2000-2010
Hillsboro CDP*	n/a	124	n/a	n/a
Truth or Consequences	7,289	6,475	-814	-11.2
Sierra County	13,270	11,988	-1,282	-0.1
New Mexico	1,819,046	2,059,179	240,133	13.2

Source: U.S. Census Bureau 2000, 2010.

Note: *2000 population statistics not available for the Hillsboro CDP.

In general, the population of Sierra County is older than that of the State as a whole. The percentage of children in Sierra County (the ROI), including those under 5 years and between 5 and 18 years, is lower than percentages for those same age groups in the State of New Mexico. Population estimates and the percent of children by age group in the Hillsboro CDP, Truth or Consequences, Sierra County, and New Mexico are shown below. (See Table 3-54.)

Table 3-54. Summary of Children by Age Group

Table 3-54. Summary of Children by Age Group							
Location	Total Population	Children Under 5 Years		Children 5 to 18 Years		All Children Under 18 Years	
		Estimate	Percent	Estimate	Percent	Estimate	Percent
Hillsboro CDP	124	0.0	0.0	4	3.2	4	3.2
Truth or Consequences	6,475	368	5.7	736	11.4	1,104	17.1
Sierra County	11,988	568	4.7	1,360	11.3	1,928	16.1
New Mexico	2,059,179	144,981	7.0	373,691	18.1	518,672	25.2

Source: U.S. Census Bureau 2010.

The distribution of population by age in Sierra County, including the Hillsboro CDP and Truth or Consequences, and New Mexico is summarized below. (See Table 3-55.) The percent of the population between the ages of 19 and 44 is lower in Sierra County than in the State as a whole. The percent of persons 65 and older in Sierra County is about double the percent in the State overall.

Table 3-55. Distribution of Population by Age, 2010

Table 3-55. Distribution of Population by Age, 2010				
Location	Percent Under 18 Years	Percent 19-44 Years	Percent 45-64 Years	Percent 65 and Older
Hillsboro CDP	3.2	6.4	45.2	45.2
Truth or Consequences	17.1	37.3	30.7	14.9
Sierra County	16.0	21.0	32.4	30.6
New Mexico	25.1	64.8	26.5	13.2

Source: U.S. Census Bureau 2010.

The components of population change between 2010 and 2013 are summarized below. (See Table 3-56.) Births and deaths are estimated using reports from the National Center for Health Statistics and the Federal-State Cooperative for Population Estimates. Between 2010 and 2013, the Sierra County population decreased by 416 people (USCB 2013). Deaths exceeded births each year and overall (USCB 2013). Given the age distribution of the population, decreases in population due to "natural events" can be expected to continue. Generally speaking, the birth and death estimates are the most reliable parts of the population estimates program, as all states require birth and death certificates.

Domestic in- and out-migration includes all changes of residence including moving into, out of, or within a given area (i.e., Sierra County) in the United States. International migration refers to movement of people across the borders of the United States. Domestic migration estimates are based on Internal Revenue Service tax exemptions, change in Medicare enrollment, and change in the group quarters population and are therefore less reliable than birth and death estimates. The total population change includes a residual, or the change in population that cannot be attributed to any specific demographic component (USCB 2015).

Table 3-56. Components of Population Change in Sierra County, 2010-2013

Table 3-56. Components of Population Change in Sierra County, 2010-2013

Component	Time Period			
	2010-2011	2011-2012	2012-2013	Total Change 2010-2013
Births	99	100	92	299
Deaths	245	238	227	705
Domestic Migration	76	22	-163	13
International Migration	-4	-1	-4	-13
Total Population Change	**-74**	**-119**	**-328**	**-416**

Source: U.S. Census Bureau 2013.

Note: The total population change includes a residual, or the change in population that cannot be attributed to any specific demographic component.

3.22.1.1.2 Housing

A housing unit refers to a house, an apartment, a mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters, or if vacant, intended for occupancy as separate living quarters. An owner-occupied housing unit indicates that the owner or co-owner lives in the unit even if mortgaged or not fully paid for. The median value(s) of housing units reflects housing units with and without a mortgage. A household includes all the people who occupy a housing unit as their usual place of residence.

Sierra County has 8,356 total housing units, 70.8 percent of which are occupied. About half of homeowners in Sierra County -- including in the Hillsboro CDP and Truth or Consequences -- occupy their housing unit. The median value of housing in New Mexico is 30 percent higher than in Sierra County, and 50 percent higher than in Truth or Consequences. Housing characteristics are shown in Table 3-57.

Table 3-57. Housing Characteristics

Table 3-57. Housing Characteristics					
Location	Total Housing Units	Occupied Housing Units (%)	Owner-Occupied Housing Units	Home-ownership Rate	Median Value of Owner-Occupied Housing Units*
Hillsboro CDP	129	60.5	48.1	60.46%	n/a
Truth or Consequences	4,226	76.8	47.9	63.5%	$80,300
Sierra County	8,356	70.8	51.2	72.4%	$92,800
New Mexico	901,388	87.8	60.1	68.5%	$158,400

Source: U.S. Census Bureau 2010.

Note: *2006-2010 estimates.

3.22.1.2 Labor

3.22.1.2.1 Civilian Labor Force

The size of a county's civilian labor force is measured as the sum of those currently employed and unemployed. From 2000 to 2010, Sierra County's labor force grew 3.9 percent faster than the State's (BLS 2000; BLS 2010). (See Table 3-58.)

Table 3-58. Civilian Labor Force, 2000-2010

Table 3-58. Civilian Labor Force, 2000-2010				
Location	2000	2010	Numeric Change 2000-2010	Percent Change 2000-2010
Sierra County	5,295	5,923	628	11.9
New Mexico	143,944,264	155,552,647	11,608,383	8.0

Source: Bureau of Labor Statistics 2000, 2010.

3.22.1.2.2 Employment

Annual employment levels in Sierra County for the years 2000 and 2010 are exhibited below. (See Table 3-59.) The BLS does not provide employment figures for the City of Truth or Consequences or the Hillsboro CDP. From 2000 to 2010, employment in Sierra County increased 9.8 percent. The number employed in New Mexico increased by 50,175 persons, or 6.2 percent, over the same 10-year period.

Table 3-59. Annual Employment

Table 3-59. Annual Employment				
	Number in Employment			
Location	2000	2010	Numeric Change	Percent Change 2000-2010
Sierra County	5,060	5,555	495	9.8
New Mexico	810,027	860,202	50,175	6.2

Source: Bureau of Labor Statistics 2000, 2010.

Health Care and Social Assistance is the industry with the most employment statewide and in 12 of New Mexico's counties, including Sierra County. The three largest employers in Sierra County – Sierra Home Health and Hospice, Sierra Vista Hospital, and New Mexico State Veterans Home – each employ between 100 and 249 persons. The seven next largest businesses, each employing between 50 and 99 persons, include:

1. Ambercare Hospice – hospices;
2. Smithco Construction – utility contractors;
3. M A & Sons – dried/dehydrated fruits and vegetables;
4. Walmart Supercenter – department stores;
5. Percha Creek Traders – art galleries and dealers;
6. Truth or Consequences Elementary – schools; and
7. Denny's – full-service restaurant.

The construction, retail trade, and accommodation of food services sectors have the largest number of establishments in Sierra County. The number of establishments in each sector, the number or range of employees at each establishment, and the most frequent establishment size in the sector based on the number or range of employees is shown below. (See Table 3-60.) Of 496 businesses county-wide, 369 have between 1 and 4 employees; 111 employers have between 5 and 9 employees; 30 have between 20 and 49 employees; and 7 have between 50 and 249 employees; 3 have between 100 and 249 employees (USCB 2007).

3.22.1.2.3 Unemployment Rates

The unemployment rate is defined as the number of unemployed persons divided by the labor force, where the labor force is the number of unemployed persons plus the number of employed persons. Sierra County's 2010 unemployment rate is 6.8 percent, the highest it has been since 2000, but still lower than the State's 7.9 percent. Both the county and State unemployment rates rose and fell with national trends. County and State unemployment rates decreased at roughly the same rate between 2004 and 2006; then experienced a sharp increase in 2008. The latter can be attributed to the 2008 economic crisis, which was part of the global financial downturn.

3.22.1.3 Earnings

Several measures are used to discuss earnings, including per capita personal income (PCPI), total industry income, and compensation by industry. Personal income data are measured and reported for the county of the place of residence. PCPI, then, is the personal income for county residents divided by the total county's population. Compensation data, however, are measured and reported for the county of work location, and are typically reported on a per job basis. Compensation data indicate the wages and salaries for work done in a particular place (e.g., a county), but if the worker does not live in the county where the work occurred then a sizeable portion would be spent elsewhere. These expenditures will not remain in or flow back into that county's economy. Total compensation includes wages and salaries as well as employer contribution for employee retirement funds, social security, health insurance, and life insurance.

Table 3-60. Establishments and Employees in Sierra County, 2007

Sector	# of Establishments	# of Employees (Value or Range)	Most Frequent Establishment Size by # of Employees (Mode)
Mining	3	20-99	1-4
Utilities	2	20-99	5-19
Construction	35	263	1-4
Manufacturing	5	85	5-49
Retail trade	53	389	1-4
Transportation and warehousing	7	6	1-4
Information	4	20-99	1-4
Finance and insurance	16	79	1-4
Real estate and rental and leasing	11	20-99	1-4
Professional, scientific, and technical services	15	53	1-4
Management of companies and enterprises	1	0-19	10-19
Administrative and support and waste management and remediation services	6	0-19	1-4
Educational services	1	0-19	1-4
Health care and social assistance	21	541	1-4
Arts, entertainment, and recreation	5	35	1-19
Accommodation and food services	38	414	1-4
Other services (except public administration)	25	141	1-4
Total for all sectors	**248**	**2140**	**1-4**

Source: U.S. Census Bureau 2007.

3.22.1.3.1 Per Capita Personal Income

Personal income is the income received by all persons from all sources, or the sum of net earnings by a place of residence, property income, and personal current transfer receipts (USDOC 2012). This includes earnings from work received during the period. It also includes interest and dividends received, as well as government transfer payments, such as social security checks. It is measured before the deduction of personal income taxes and other personal taxes and is reported in current dollars.

Annual PCPI for 2000, 2005, and 2010 for Sierra County and the State of New Mexico are shown below. (See Table 3-61.) All dollar estimates are in current dollars (not adjusted for inflation).

Table 3-61. Per Capita Personal Income

Table 3-61. Per Capita Personal Income				
	Income			
Location	2001	2005	2010	Percent Change 2000-2010
Sierra County	$19,691	$23,242	$32,139	63.2
New Mexico	$24,751	$28,641	$33,342	34.7

Source: U.S. Department of Commerce 2010.

In 2010, the PCPI in Sierra County was $32,139, representing a 63.2 percent increase since 2001. While the State PCPI was higher than Sierra County's during this 9-year interval, the annual per capita income in Sierra County grew almost 30 percent faster than in the State overall. The differential between the two steadily decreased over the 2001-2010; in 2010 the Sierra County's PCPI was only about $1,000 less than the State average. The interrelated increases in labor force, employment, and PCPI can be attributed in part to aging and shrinking resident population; new developments such as Spaceport America; as well the ongoing revival of downtown Truth or Consequences.

3.22.1.3.2 Industry Compensation

What is often termed in economic data "total industry compensation" is somewhat of a misnomer, in that a portion of the "industry earnings" stems from government related activity. This is made clear when the composition of industry compensation is presented. Nevertheless, total industry compensation provides a good picture of the relative sizes of market related economic activity, or business activity, performed in a county. (See Table 3-62.)

Income is generated by economic activity in Sierra County through a variety of sectors, including various types of business as well as government. This income is not always received by a person living in the county; for example, a person from neighboring counties may cross county lines to go to work. The employee compensation by industry, however, is a measure of economic activity generated in the county, regardless of where the employee resides.

Sierra County's main economic drivers are agriculture, healthcare, and tourism. The agriculture industry consists primarily of cattle ranching (NMWC 2013). Government and government enterprises accounted for a total of $49,705,000 (about 50 percent) of the annual compensation of employees in 2010. Sierra County, the City of Truth or Consequences, and the Truth or Consequences Public Schools are some of the largest employers in Sierra County. (See Table 3-62.)

Table 3-62. Compensation of Employees by Industry in Sierra County ($100)

Table 3-62. Compensation of Employees by Industry in Sierra County ($100)			
Sector	**2001**	**2005**	**2010**
Farm (crops, livestock, and dairy)	2,993	3,717	4,248
Forestry, fishing, related activities	(D)	(D)	(D)
Mining	(D)	(D)	(D)
Oil and gas extraction	0	0	0
Mining (except oil and gas)	(D)	0	0
Support activities for mining	0	(D)	448
Utilities	(D)	(D)	(D)
Construction	(D)	5141	9,394
Manufacturing	(D)	4013	5,503
Wholesale trade	(D)	(D)	(D)
Retail trade	7,476	6,740	10,797
Transportation and warehousing	(D)	714	214
Information	967	335	660
Finance and insurance	1,551	2,291	2,751
Real estate	(D)	444	498
Rental and leasing services	(D)	194	145
Professional, scientific, and technical services	1,254	5,747	3,408
Management of companies and enterprises	0	0	0
Administrative and waste management services	1,945	739	1,520
Educational services	(D)	(D)	(D)
Health care and social assistance	(D)	(D)	(D)
Arts, entertainment, recreation	664	701	975
Accommodation and food services	5,876	5,261	6,749
Other services except public administration	2,742	3,123	3,852
Government and government enterprises	34,946	41,036	49,705
Total	**60,414**	**80,196**	**100,867**

Source: U.S. Department of Commerce 2001-2010.

Note: (D) Not shown to avoid disclosure of individual confidential information.

Spaceport America, the commercial aerospace facility just west of the White Sands Missile Range, opened in 2011. The final EIS for the Spaceport American Commercial Launch Site estimated that the project would create up to 725 jobs during construction and about 225 during launch operations (FAA 2008). Since 2010, more than $3.6 million had been paid to New Mexico suppliers, and SpaceX had expended more than $2 million on construction of the facility, which includes a landing pad, propellant tanks and a mission control center (TSR 2014; SA 2014). By the end of 2014 Virgin Galactic had spent more than $2.6 million in rent and fees to the New Mexico Spaceport Authority (NMSA).

According to Spaceport America, over 1,400 New Mexico residents were employed during the development and construction phase – about 10 percent were residents of Sierra County. In the current operational phase, about 100 people are employed – approximately 15 percent of which are residents of Sierra County. The Chief Executive Officer projects a total of 200 FTE jobs and 150 PTE jobs – about 20 percent of which would be Sierra County residents (Spaceport America 2015).

3.22.1.4 Public Finance

The State of New Mexico levies direct taxes on extractive industries operating in the State: the severance and processors taxes are State taxes and revenues go directly to the State. Tax rates for each mineral are imposed on the value of production less specified exemptions and deductions. The taxable value for both the severance and processors tax are based on production value, but production value is defined differently for each tax. Extractive industries are also subject to property taxes for non-operating mines and the copper ad valorem tax for operating mines. The copper ad valorem tax is dependent upon: 1) the value of the mine and all real and personal property; and 2) the value of salable minerals (NMTRD 2012b).

3.22.1.4.1 Processors Tax

The Resources Excise Tax Act (Section 7-25-4 NMSA 1978) consists of three taxes (resources, processors, and services) on activities related to natural resources in New Mexico. The processors tax applies if the entity owns the land and is processing hard minerals. Exempted from the resources tax is the taxable value of any natural resource that is processed in New Mexico and on whose taxable value the processors tax is paid (NM State Statutes 7-25-7). Since the copper and other minerals from the Copper Flat mine would be processed in New Mexico and NMCC would pay the processors tax, NMCC would be exempt from the resources and services tax.

The tax liability for the processors tax is determined by applying specific tax rates to the taxable value. (See Table 3-63.) The taxable value for the processors tax is specified in NM State Statutes 7-25-3. In essence, it is the value of the resource minus transportation costs and royalty payments.

3.22.1.4.2 Severance Tax

New Mexico imposes a severance tax on the privilege of severing natural resources. Calculation of the taxable value for the purposes of the severance tax includes determining the gross value and then deducting royalty payments. The severance tax rates for copper, silver, gold, and molybdenum are listed below. (See Table 3-63.)

Table 3-63. Severance and Processors Statutory Tax Rates

Table 3-63. Severance and Processors Statutory Tax Rates		
	Statutory Tax Rates (% of Taxable Value)	
Mineral	**Severance Tax**	**Processors Tax**
Copper	0.50	0.75
Molybdenum	0.13	0.13
Gold	0.20	0.75
Silver	0.20	0.75

Source: NMSA 7-26-5.

3.22.1.4.3 Royalties

The land (2,189 acres) designated as the mine area consists of both patented and unpatented mining claims and fee land. The NMCC now owns a 100 percent interest in the mineral and surface estates in the patented mining claims, other patented land, and unpatented mining claims and millsites included in the mine area (NMCC 2013). There is no royalty for hardrock mining on Federal land, and royalties would not be paid to the New Mexico State Land Office since mineral production would not be derived from State Trust land (GAO 2009).

Advance royalty and net smelter return royalty rates, permissible deductions, and payment schedules are negotiated agreements between NMCC and Hydro Resources, Copper Flat LLC, and GCM (previous mineral rights holders). The amended *Option and Purchase Agreement with Hydro Resources, Cu Flat LLC, and GCM* stipulates that advance royalty payments would occur every 3 months after obtaining all State and Federal permits required for the commercial operation of the mine. The amount of the advance royalty payment would depend on the price of copper during the 3 calendar months preceding the month in which the payment is due. If the price of copper during the 3-month period is below $2.00/lb., the advance royalty payment would be $50,000. If the price of copper is above $2.00/lb., the advance royalty payment would be $112,500 (NMCC 2013).

NMCC may be required to pay 3.25 percent in NSR royalties "for any quarter in which there is 'gross revenue." NMCC's obligation to pay NSR royalty starts after 1) mineral products are sold; and 2) the aggregate amount of NSR royalty payments otherwise due exceeds the aggregate amount of advance royalty payments made to date. The NSR royalty would be charged as 3.25 percentage of the mineral's gross value, dependent upon the volume and grade of mineral processed each year; metal recovery rates; metal prices; and the terms of the assumed smelter contract. Permissible deductions would include costs associated with transportation, storage, smelting, and refining as well as resource excise and severance taxes; but not mineral extraction costs (NMCC 2013; NMCC 2015a).

NMCC's obligation for advance royalty payments (but not NSR royalty payments) would end when the aggregate amount of all payments of NSR royalty and advance royalty exceed $10,000,000 or when NMCC has relinquished and terminated any and all rights to conduct commercial production (NMCC 2013; NMCC 2015a). Advance royalty payments made to Hydro Resources, Cu Flat LLC, and GMC – after NMCC has received the State and Federal permits required for commercial operation of the mine but before mineral products are sold – can be credited against NSR Royalties payments (NMCC 2015a).

3.22.1.4.4 Property Taxes and Copper Ad Valorem Tax

New Mexico levies property taxes on the owner of each copper mineral property under Property Tax Code (Section 7-39-8 NMSA 1978). As mentioned previously, the NMCC now owns a 100 percent interest in the mineral and surface estates in the patented mining claims, other patented land, and unpatented mining claims and millsites included in the mine area. NMCC will pay property taxes to Sierra County on private property and improvements to patented mining claims, or land to which NMCC has title. NMCC also holds rights to unpatented mining claims and millsites located on public land administered by the BLM, or land to which the Federal government has title. NMCC pays and will continue to pay an annual fee to the BLM to maintain rights to the unpatented claims and millsites. Sierra County does not assess property tax for unpatented claims on Federal land.

For non-operating mines, the property is taxed at the normal, non-residential county rate of 0.775 percent. The net taxable value for property tax purposes in Sierra County was $265,596,091 and non-residential taxable value was $112,696,726 in 2009 (NMTRD 2009). Sierra County will continue to collect property taxes on NMCC-owned property to which it has patented mining claims until the mine becomes active and starts selling a mineral product. At that time, the current property tax assessment would be replaced with an ad valorem tax based on the gross value of production.

The copper ad valorem tax is imposed on active copper production in lieu of the property tax, and is levied on the value of the mine and all real and personal property held or used for the purpose of mining (i.e., equipment for processing in a concentrator, solvent extraction or electrowinning plant, precipitation plant, or a smelter). The taxable event occurs when the severer sells copper in New Mexico or when the severer ships, transmits, or transports copper out of New Mexico without first making sale of the resource.

Like property taxes, copper ad valorem tax revenue is added to the Copper Production Tax Fund, which is distributed by State and county treasurers to taxing authorities. Sierra County currently does not produce copper, and as such no taxes are levied on ad valorem production or equipment. In 2009, the net taxable value of copper production in New Mexico (i.e., Grant and Hidalgo Counties) was $172,480,724 (NMTRD 2010).

3.22.1.4.5 Indirect Taxes

The State of New Mexico imposes a Gross Receipts Tax (GRT) on sales and services provided in the State, including selling property in New Mexico and leasing (or licensing) property employed in New Mexico. The tax rate varies by location; the prevailing GRT at the project site is 6.3125 percent. For goods and services purchased outside of the State, a compensating tax is levied at a rate of 5.125 percent in order to protect New Mexico businesses from unfair competition from out-of-State businesses not subject to GRT. The State collects the tax and distributes the appropriate amounts to local government units.

The primary source of municipal and county revenues in Sierra County is gross receipts from spending at local businesses. GRT in Sierra County increased 71 percent between 2005 and 2010, while receipts in New Mexico increased 8.9 percent in the State of New Mexico (NMTRD 2010b). In the March 2008 special election, Sierra County's residents voted to increase the GRT rate by 0.25 percent to provide Spaceport America the funding and taxation district needed to build the publicly financed facility. The GRT increase means residents pay an additional 25 cents for every $100 on purchases (Las Cruces Sun-News 2008). (See Table 3-64.)

Table 3-64. Gross Receipts Tax, 2005-2010

Table 3-64. Gross Receipts Tax, 2005-2010			
	Receipts		Percent Change 2005-2010
Location	2005	2010	
Sierra County	$38,871,515	$66,474,914	71.0
New Mexico	$13,275,583,875	$14,450,723,812	8.9

Source: New Mexico Taxation and Revenue Department 2005-2010.

3.22.1.4.6 Payment in Lieu of Taxes

Under federal law, local governments (usually counties) are compensated through various programs for reductions to their property tax bases due to the presence of most Federally-owned land. This land cannot be taxed, but may create a demand for services such as fire protection, police cooperation, or longer roads to skirt the Federal property. Some compensation programs are run by specific agencies and apply only to that agency's land. The most widely applicable program, administered by the Department of the Interior (DOI), is called "Payments in Lieu of Taxes" (PILT, 31 U.S.C. §6901-6907).

In Sierra County, three categories of Federal land is eligible for PILT payments:

1. Land dedicated to the use of Federal water resources development projects (under jurisdiction of the Bureau of Reclamation);
2. Land in the National Forest System; and
3. Land administered by the BLM (CRS 2014).

From 2000-2010, the BLM accounted for almost 65 percent of all PILT-eligible acreage in Sierra County. During this 10-year period, BLM acreage decreased by 56 acres overall and the total USFS acreage increased by 398 acres. Total Bureau of Reclamation (BOR) acreage decreased by 37,458.

In Sierra County, approximately $30,000 each year goes to the county road department and the balance goes to the county general fund. PILT monies from the BLM, USFS, and BOR contribute roughly half of the county's budget (SCBC 2006). (See Table 3-65.)

Table 3-65. Acres and PILT payments in Sierra County, 2005-2010

Table 3-65. Acres and PILT Payment in Sierra County, 2005-2010					
Year	**BLM (acres)**	**USFS (acres)**	**BOR (acres)**	**Total Acres**	**Payment**
2005	854,140	386,854	95,945	1,336,939	$762,903
2006	854,122	386,851	58,574	1,299,547	$762,903
2007	854,087	386,851	58,574	1,299,512	$773,198
2008	854,087	386,851	58,574	1,299,512	$1,225,105
2009	854,087	386,851	58,574	1,299,512	$1,210,735
2010	854,087	386,851	58,574	1,299,512	$896,178

Source: U.S. Department of the Interior 2000-2010.

The authorized level of PILT payments is calculated under a complex formula. No precise dollar figure can be given in advance for each year's PILT authorized level. Payments to individual counties may vary from the prior year because of changes in acreage data, which is updated yearly by the federal agency administering the land; population data, which is updated based on U.S. Census Bureau data; and the prior year revenue payment, which is reported by states. The per acre and population variables used to compute payments are also adjusted for inflation, using the Consumer Price Index and Census data, as required by 1994 amendments to the Payments in Lieu of Taxes Act (CRS 2014).

From 1994 to 2008, payments have not matched the full entitlement level because funding levels were subject to appropriation. Payments to local jurisdictions funded from 41 to 77 percent of the entitlement levels. However, the Emergency Economic Stabilization Act of 2008 made the PILT program mandatory, so beginning with the FY2008 payment and continuing through FY2012, payments equaled the full entitlement levels for each county that receives PILT payments. Indeed, the 2007 payment increased from $773,198 in 2007 to $1,225,105 in 2008.

3.22.1.5 Community Services

3.22.1.5.1 Police and Fire Services

There are a total of 14 full-time law enforcement employees and 179 volunteer firefighters in Sierra County (FBI 2010; USFA 2012; TCVFD 2014). A county's fire and police district, with the approval of the Board of County Commissioners, may service another district in an adjacent county pursuant to a mutual aid agreement. Most firefighting and law enforcement units in Sierra County share mutual aid agreements with surrounding counties that allow cross-coverage for emergencies (NMAC 2012).

3.22.1.5.1.1 Law Enforcement

The Sierra County Sheriff's Department has a total of 14 law enforcement employees, including 12 officers and two civilians (FBI 2010). Both the Sierra County's Sheriff's Department and the City of Truth or Consequences Police Department are located in the City of Truth or Consequences. In 2008, New Mexico State Police employed 528 full-time sworn personnel, or 27 law enforcement officers per 100,000 residents; decreasing 11.2 percent since 2004 (USDOJ 2008).

The 911 program in Sierra County was launched a decade ago in response to national security concerns. The purpose is to create a single map system with an address for all residences; reduce redundancy in road names; and foster the adequate marking of addresses for emergency services. The program's project manager stated that this program is 90 percent complete, but the map is not yet ready for public distribution. While all addresses have been entered into the system, the database has inconsistencies that need to be rectified (SCBC 2006).

The Law Enforcement Protection Fund Act (§29-13-1 through 9 NMSA) provides limited funds to municipal and county Police and Sheriff Departments for maintenance and improvement of those departments. The act outlines a distribution formula that provides annual payments of $20,000 for counties with populations less than 20,000 persons (i.e., Sierra County).

3.22.1.5.1.2 Fire Resources – Volunteer Fire Departments

The impetus to create volunteer fire departments (VFDs) in the last few years has come from the Department of Homeland Security, which has funded training and equipment to increase disaster preparedness. The National Fire Plan, administered through the U.S. Forest Service, has channeled funding and training to the VFDs in Sierra County in recent years. VFDs have been conducting patrols and prevention work.

All fire departments in Sierra County are VFDs: Truth or Consequences, Elephant Butte, Las Palomas, Poverty Creek, Winston Chloride, Lakeshore, Arrey/Derry, Caballo, Monticello, and Hillsboro. There are a total of 10 VFDs, 13 stations, and 179 volunteer firefighters in Sierra County. (See Table 3-66.)

Table 3-66. Volunteer Fire Departments in Sierra County

Table 3-66. Volunteer Fire Departments in Sierra County		
Fire Department	**Number of Stations**	**Volunteer Firefighters**
Arrey-Derry Fire Department	2	16
Caballo Fire & Rescue	1	20
Hillsboro Fire/Rescue Department	2	19
Lakeshore Fire Department	1	12
Las Palomas Volunteer Fire Department	1	15
Monticello-Placita Volunteer Fire Department	1	15
Truth or Consequences Volunteer Fire Department	2	25
Winston Chloride Volunteer Fire Department	1	10
Elephant Butte Fire Department	1	24
Poverty Creek Volunteer Fire Department	1	23
Total	**13**	**179**

Source: U.S. Fire Administration 2012; Truth or Consequences Volunteer Fire Department 2014.

The Truth or Consequences Volunteer Fire District services the proposed project area, and all calls are dispatched through the Truth or Consequences VFD. Established in 1923, it carries an Insurance Services Organization rating of Class 5. The station includes a roster of 25 volunteer firefighters; two fire stations; four fire engines; and one ladder truck.

The BLM also makes contributions related to fire protection. Because they are first responders, rural volunteer fire departments are invited to submit lists of equipment needs of which the BLM funds a portion through its Rural Fire Assistance program. The BLM uses "fuel hazard" monies to treat brush, create fire lines, and protect infrastructure on public land. For example, the BLM recently funded work to reduce the fire hazard near a telecommunications tower near Winston (SCCP 2006).

3.22.1.5.1.3 Emergency Management

The County has an Emergency Management Office whose purpose is to be the liaison resource for all agencies with regard to fire, police, and other emergency medical needs for both volunteer and paid positions. It is funded through the State Office of Emergency Management.

The Sierra County Community Emergency Response Team (CERT) was established in 1997 under the administration of the Federal Emergency Management Agency. The CERT Program educates people about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. Using the training provided in the classroom and during exercises, CERT members can assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help (FEMA 2014). Sierra County CERT has 40-45 active members and nine CERT trainers. All members and trainers are volunteers and all have been trained as first responders in emergencies and disasters (SCCP 2006). Since its establishment in 1997, the Sierra County CERT has responded to 10 flood and winter storm emergencies, conducting activities such as general evacuation, sandbagging, and staffing shelters. The Sierra County CERT has also performed other non-emergency functions including emergency preparedness, home safety, and prevention assistance such as winterizing homes, fire safety actions, and crime prevention steps (FEMA 2012).

3.22.1.5.2 Health Services

Sierra Vista Hospital is a rural, community-owned and community-operated 25-bed critical access hospital healthcare facility located in the City of Truth or Consequences. A member of the New Mexico Hospitals and Health Systems Association, the hospital serves the 13,000 residents as well as the 900,000 annual visitors. Patients have access to services provided by Sierra Vista Hospital's laboratory, radiology department, respiratory care, physical therapy, ambulance, emergency department, specialty clinics, and many other services (SVH 2012). Sierra County is listed as a health professional shortage area, or as having limited capacity to handle healthcare emergencies or increases in service demand.

Other healthcare facilities in Sierra County and the services they provide include:

- Ben Archer Health Center – Health clinic, behavioral health, primary care, X-rays, dental care, counseling, immunizations, transportation;
- Milagro Health Center – Health clinic/services;
- New Mexico Department of Health, Sierra County Public Health – Advocacy, family planning, health clinic, immigrant, immunizations, infectious diseases, prenatal care;
- New Mexico State Veterans Home – Advocacy, health services, housing, transportation;
- Sierra Health Care Center – Skilled nursing, therapy, rehab, Alzheimer's unit, advocacy, home visitation;
- Sierra Outpatient Rehabilitation & Therapy – Advocacy, support, senior services/care, recovery, disabilities, health information/services; and
- Sierra Home Health, Hospice, and Homemaking Services/PCO – Advocacy, support, senior services, home visitation, counseling, disabilities, education, health information/services, prescriptions (SHC 2014).

As mentioned earlier, three of the four major employers in Sierra County provide healthcare services. New Mexico State Veterans Home, Sierra Vista Hospital, and Sierra Home Health, Hospice, and Homemaking Services each employed between 100-249 persons in 2010 (NMWFS 2014).

Every county is responsible for ambulance transportation and hospital care of indigent patients under the provisions of the Indigent Hospital and County Health Care Act (§27-5-2 NMSA). Ambulance service may be furnished to points outside the county provided no local established ambulance service in the area is available, or if one exists, such service has inadequate capacity or is insufficient for the service requested. The county may use funds from the Indigent Care Funds Act to pay for ambulance service for indigent persons (§27-5-2 NMSA).

3.22.1.5.3 Education

3.22.1.5.3.1 Schools

Students residing in Sierra County attend schools in the Truth or Consequences Municipal School District. Total enrollment, functional capacity, number of classrooms, and student to teacher ratio for the five schools in the Truth or Consequences School District are presented below. (See Table 3-67.) Figures for the functional capacity, utilization capacity, and the number of classrooms in each school assume the use of portable classrooms.

Table 3-67. Truth or Consequences School District, 2010-2011

Table 3-67. Truth or Consequences School District, 2010-2011					
School	**Enrollment**	**Functional Capacity***	**Utilization Capacity***	**# of Classrooms***	**Student to Teacher Ratio**
Arrey Elementary School (Pre-K-5)	133	263	50.6	17	15:1
Truth or Consequences Elementary School (Pre-K-3)	357	396	95.1	31	17:1
Sierra Elementary Complex (4-5)	161	196	88.3	13	12:1
Truth or Consequences Middle School (6-8)	318	448	71.0	26	15:1
Hot Springs High School (9-12)	407	604	68.9	35	13:1

Source: New Mexico Public Education Department 2011; NCES 2011.
Note: *With portable classrooms.

The Truth or Consequences Municipal School District maintains approximately 238,700 square feet of school and support facilities for almost 1,400 students. The 2011 Truth or Consequences Municipal School District Facilities Master Plan (FMP) determined that schools currently have adequate classrooms to accommodate current student enrollment. However, the Truth or Consequences Elementary School and Sierra Elementary rely on portable classroom units to maintain adequacy, and both are projected to soon be over capacity (ARC 2011).

The "high range" scenario in the 2011 FMP assumed development of the Spaceport and the Copper Flat mine (beginning in 2015) would increase population growth and birth rates. Under this scenario, ARC projects that enrollment will increase at 2.4 percent per year on average beginning in 2016-2017. Under this scenario: The Truth or Consequences Elementary School would not have sufficient classroom space; Arrey Elementary would have substantial capacity; Sierra Elementary is projected to have increasing capacity; and the Truth or Consequences Middle School and Hot Springs High School would have a classroom surplus (ARC 2011).

3.22.1.5.3.2 Continuing Education

Educational attainment in the Hillsboro CDP is significantly lower than in Truth or Consequences, Sierra County, and New Mexico. About 78.1 percent of the total population in the Hillsboro CDP has less than a ninth-grade education. An overview of educational attainment for the population aged 25 and older in the Hillsboro CDP, Truth or Consequences, Sierra County, and New Mexico is presented below. (See Table 3-68.)

Table 3-68. Highest Level of Educational Attainment, 2010

Table 3-68. Highest Level of Educational Attainment, 2010				
Location	**Population 25 years and over**	**High school Graduate (%)***	**Some college, no degree (%)**	**Bachelor's Degree or higher (%)**
Hillsboro CDP	183	8.2	0	0
Truth or Consequences	4,231	38.6	25.2	16.8
Sierra County	8,488	37.3	24.5	16.8
New Mexico	1,296,627	27.0	23.1	25.5

Source: U.S. Census Bureau 2006-2010.

Note: *Includes equivalency.

The relatively low levels of educational attainment and technical skills in Sierra County have provided challenges to attracting employers to the area. Western New Mexico University's branch community college in Sierra County offers a number of adult education classes, including certification programs aimed at students interested in immediate employment in certain target job markets. The school is also an excellent local resource for those who wish to expand their professional skills or take prerequisite courses that can lead to transferring to a 4-year college or university. The Workforce Investment Act, a State initiative with Federal funding, provides funds to Sierra County youths aged 14-21 with work experiences through business partnerships (SCCP 2006).

3.22.1.6 Community Cohesion and Quality of Life

3.22.1.6.1 Community Cohesion

Community cohesion is the degree to which residents have a sense of belonging to their neighborhood or community, including commitment to the community or a strong attachment to neighbors, institutions, or particular groups. Determining the level of community cohesion is by nature subjective and requires professional judgment.

Several economic, social, and cultural factors shape and influence a community's level of cohesion or the level of cohesion between communities. Given the complexity of relationships within and between communities, there does not exist a defined set of indicators to determine the level of community cohesion (expressed as high, medium, or low). Cohesive communities are generally associated with certain characteristics that revolve around age, income, race, and residential status. Individual indicators considered may change based on the location; project size and type; scope of an analysis; and available data. Studies show that indicators of higher community cohesion can include the following:

- Residential stability (e.g., households of two or more people, homeownership);
- Residential longevity;
- Working class families;

- Ethnic homogeneity;
- Parks and other community facilities; and
- Higher proportions of senior citizens (Caltrans 1997; FDOT 2000; Caltrans and FHWA 2015).

Information from public scoping comments; newspaper publications; public documents (e.g., past EISs, development projects); academic publications on the topic; recent social and economic (including mining) history of the area; and project information were also reviewed to identify a reasonable and relevant set of indicators to consider in determining the level of community cohesion in Sierra County. Table 3-69 includes figures for community cohesion indicators selected for the purpose of this analysis. Sierra County is considered to have a medium level of community cohesion.

Table 3-69. Community Cohesion Indicators in Sierra County

Table 3-69. Community Cohesion Indicators in Sierra County					
Location	**Householder Moved to Unit after 2000 (%)**	**Median Household Income***	**Ethnic Homogeneity**	**Homeownership Rate (%)**	**Persons 65 Years and Older (%)**
Hillsboro CDP*	0	$24,875*	89.5	60.46	45.2
Truth or Consequences	57.4	$21,862*	85.7	63.5	14.9
Sierra County	43.7	$25,583*	85.6	78.3	30.6
New Mexico	64.6	$42,090*	68.4	69.6	13.2

Source: U.S. Census Bureau 2010 and 2006-2010.

Note: *In 2010 inflation-adjusted dollars.

Approximately 43.7 percent of householders moved into their Sierra County unit after 2000. Sierra County has a 78 percent homeownership rate and 72.4 percent are owner-occupied; roughly 2,400 units are available for rent. Additionally, 53 percent of the all households are family households.

Of the 1,950 children under the age of 17 in Sierra County, 986 live with two parents. Approximately 200 (or 11 percent) of those children have one parent in the labor force, or (presumably) one parent at home. Additionally, 30.6 percent of Sierra County's population is over the age of 65, an above-average concentration.

Since social classes lack clear boundaries and overlap, there are no definite income thresholds as for what is considered working class. Sociologist Leonard Beeghley identifies a combined household income of $66,000 as a typical working-class family (Beeghley 2004). Sociologists William Thompson and Joseph Hickey estimate an income range of roughly $16,000 to $30,000 for the working class (Thompson and Hickey 2005). The "working class" is typically associated with manual labor and high school education. The 2010 median household income in Sierra County was $25,583; 73.5 percent are high school graduates; 11.2 percent have some college or an associate's degree; and 0 percent have a bachelor's degree or higher (USCB 2010c). Sierra County qualifies as a working class community.

Ethnic homogeneity is a term used to describe an area whose population has a similar ethnic background. In Sierra County, 85.6 percent of the population is identified as having "one race"; in this case, white. Based on previous research, and comparison to income levels in other parts of New Mexico, Sierra County can be considered an area of lower median family income levels and a high level of ethnic similarity.

3.22.1.6.2 Recreation and Tourism

Local tourist and recreational attractions include Elephant Butte Lake and State Park, the Gila National Wilderness, Caballo Lake State Park, Percha Dam State Park, several museums and ghost towns, and the mineral baths located in Truth or Consequences. A more detailed discussion of backcountry byways, hunting, hiking, and sightseeing are discussed in Section 3.16, Recreation.

A total of 69 percent of the budget for State parks is supported by self-generated revenue and 31 percent is from the State general fund. The self-generated revenue is closely correlated with visitation and boating activity, and those numbers are dramatically affected by lake levels. The recent drought years have reduced revenue from park fees, boat registrations, and boat excise taxes – creating real budget strain. Some years, State parks enacted aggressive vacancy savings (delays in filling positions), spending restrictions and other efficiency steps in order to offset a total budget shortfall. Drought, wildfires, and seasonal park closures and the accompanying impacts on visitation have negatively impacted many New Mexico communities intertwined with the State parks. Other sources of self-generated receipts are received through day use, overnight camping and other services such as the use of the group shelters, group reservation areas, special use permits, and from fees generated by the sailboat "mast up" storage facility (EMNRD 2005; EMNRD 2012).

Elephant Butte Lake State Park is New Mexico's main watersports destination and attracts over 1 million visitors per year, creating about $900,000 in annual revenue (EMNRD 2015). There are over 100,000 visitors during Memorial Day weekend, marking the beginning of the summer season. Boating and fishing during the summer months are the most popular and lucrative recreational activities. The park also has numerous camping and picnicking areas, with more than 200 developed campsites and 100 electrical hook-ups for RVs and trailers.

Elephant Butte Lake State Park is a designated warmwater fishery with largemouth bass, catfish, walleye, flathead and channel catfish, crappie, black, smallmouth, white and striped bass and bluegill (EMNRD 2015). New Mexico Boating Training employs between 20 and 49 persons per year, and offers boat rentals, boating safety courses, excursions, etc. (NMWC 2013). A 10 percent Federal excise tax on the purchase of fishing equipment and motor boat fuel helps states individually promote sport fisheries. This includes acquiring easements or leases for public fishing, funding hatchery and stocking programs, supporting aquatic education programs, and improving boating facilities for anglers (NMFGD 2015).

Caballo Lake State Park is located 16 miles (26 km) south of Truth or Consequences on the Rio Grande. Water-based recreational activities include boating, kayaking, canoeing, sailing, swimming, and fishing. Caballo Lake supports largemouth bass, walleye, white bass, catfish, crappie, bluegill, northern pike, sunfish, and the occasional rainbow trout. It has 170 campsites and utility hookups for RVs; hiking, horseback riding, picnicking, and birding are also popular activities. Percha Dam State Park also offers fishing, camping, picnicking, wildlife viewing, and birding opportunities. Both parks draw hundreds of species of birds due to their location along the Rio Grande flyway, especially migratory bird species in the spring and fall. Beginning in late October, golden eagles nest in the nearby Caballo foothills, while bald eagles nest in large areas around and within Caballo Lake State Park (EMNRD 2000).

A portion of the Cibola National Forest Magdalena Ranger District, mostly in Socorro County, extends into the northern portion of Sierra County. The San Mateo Mountains offer camping, hiking, and picnicking opportunities. Luna Park – located within the Apache Kid Wilderness – and Springtime are the two developed recreation sites closest to Sierra County.

The Gila National Forest Black Range and Wilderness Ranger Districts (RDs) represent 365,618 acres in Sierra County, or 13.5 percent of the county's total acreage. The Gila Cliff Dwellings National

Monument, which is jointly managed by the National Park Service and the Forest Service under a memorandum of understanding, lies within the Wilderness RD. A large portion of the Aldo Leopold Wilderness lies within the Black Range RD, as does a small portion of the Gila Wilderness. The most popular recreational activities in the Black Range RD include camping and hiking. Wilderness permits for the Gila and Aldo Leopold Wilderness are not required, nor are camping or hiking permits. While the Gila NF has some "fee areas", most areas are not, so visitors can access many sites without charge. NM-152 bisects the Black Range RD in the south, taking travelers through the historic town of Hillsboro (32 miles southwest of Truth or Consequences). State Highway 52 provides a tour of historic towns established by ranchers, farmers, or miners throughout the 1800s and into the early 1900s. The Continental Divide National Scenic Trail and a large portion of the Geronimo Trail Scenic Byway cross the Black Range RD (USFS 2007; USFS 2015).

Annual visitation and revenue at State parks and national forests in Sierra County are presented below. (See Table 3-70.)

Table 3-70. Annual Visitation and Revenue at State Parks or National Forests in Sierra County

Table 3-70. Annual Visitation and Revenue at State Parks or National Forests in Sierra County		
State Park or National Forest	**Annual Visitation**	**Annual Revenue**
Elephant Butte State Lake Park (2010)	1,191,283	$902,856
Caballo Lake State Park (2010)	262,281	$235,994
Percha Dam State Park (2010)	55,137	$33,214
Gila National Forest (2006)	452,000	n/a
Cibola National Forest (2006)	1,056,428	n/a

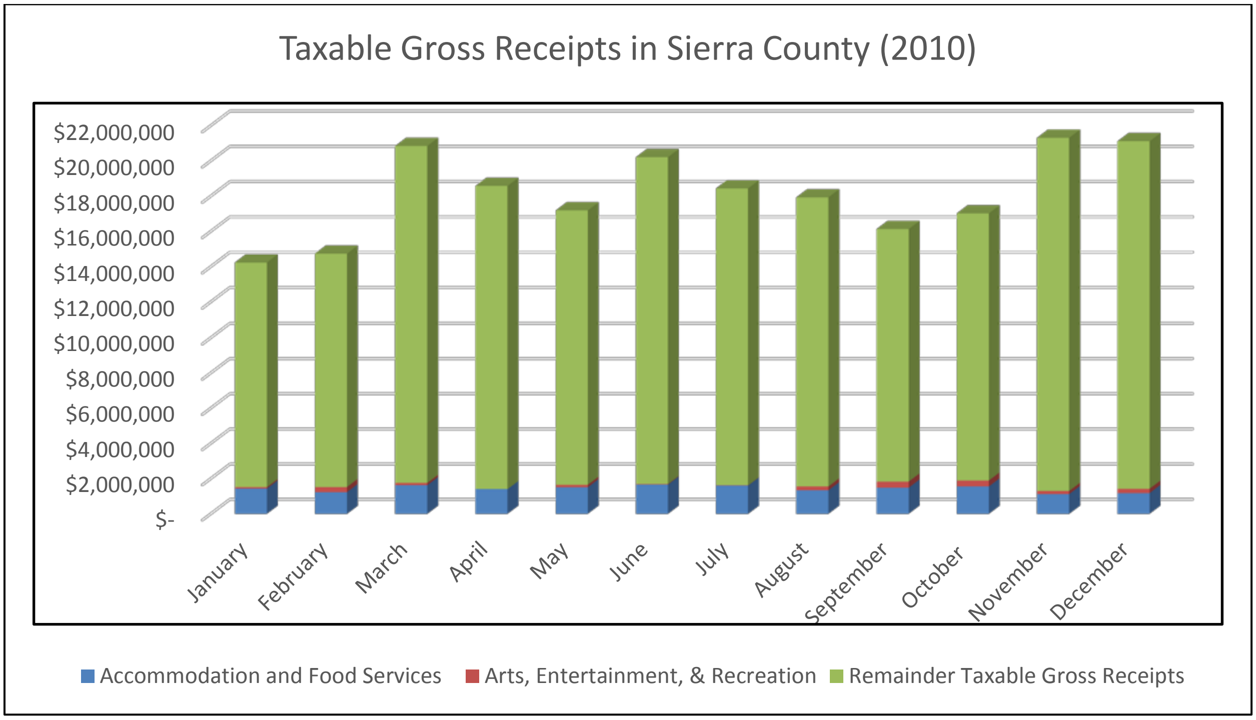
Source: Energy, Minerals, and Natural Resources Department 2015; USFS National Visitor Use Monitoring 2006.

Note: Annual Visitation and Revenue figures are most recent figures available.

The designation of the Hot Springs Bathhouse and Commercial Historic District on the National Register of Historic Places in Downtown Truth or Consequences in 2005 provided an impetus to interpret and preserve the city's mid-century architecture. The revitalization efforts of Truth or Consequences Main Street and the newly established Healing Waters Trail, a 2.3 mile urban trek, have proven successful elements of renewal (TorC 2006).

New Mexico Taxation and Revenue posts monthly data on gross tax receipts by NAICS code, including accommodation and food services. While not all tax receipts from accommodation and food services can be attributed to recreation and tourism, this provides one measure showing the importance of this sector in Sierra County over a period of 12 months. Each bar in Figure 3-48 is the accrual month; the business activity occurs the previous month and collection occurs the pursuant month. Figure 3-48 shows the gross taxable receipts for the accommodation and food; and arts, entertainment, and recreation sectors; as well as the remaining sectors in Sierra County for 2010. Overall, the accommodation and food services and arts, entertainment, and recreation sectors accounted for 10.3 percent of all gross taxable receipts in 2010 (NMTR 2010b).

Figure 3-48. Taxable Gross Receipts in Sierra County, 2010



Source: New Mexico Taxation and Revenue 2010b.

3.22.1.6.3 Quality of Life and Recreational Values

Quality of life can be characterized as a person's well-being and happiness. Like community cohesion, what constitutes a positive quality of life is subjective and cannot be solidly defined. For this analysis, quality of life considerations focus on those elements that the public generally associates with a high quality of life: education, safety, recreation opportunities, convenient shopping and services, access to transportation facilities, and a positive general living environment. Other factors, such as air quality and noise, could also contribute to a person's sense of quality of life.

Over the past few decades, the social environment of the surrounding communities has been in transition from traditional extractive associations with natural resources (i.e., grazing, ranching, agriculture, and mining) to more recreation- and tourism-based economies and lifestyles. Much of the logging industry in this part of New Mexico has disappeared; with the largest sawmill closing in 1993. Ranching continues to be a major activity in the area, but the economic viability of ranching is threatened by prolonged drought conditions and market forces. On the other hand, local tourism industries have expanded and there has been considerable amenity migration (the movement of people based on the draw of natural or cultural amenities) into the area by retirees and others, along with major investments in vacation homes (BBER 2007).

Values and beliefs associated with recreation link residents to public land and resources. These same natural amenities attract retirees and others to the area. Environmental amenities associated with the Elephant Butte Lake State Park, parts of the Gila and Cibola National Forests, the Black Range Mountains, Turtleback Mountain, and the banks of the Rio Grande contribute to the region's identity, as well as area quality of life. Proximity to this land can influence where people chose to live (i.e., migration) and how much people are willing to pay for housing (i.e., property values).

Research by Hand et al. indicates that people make regional housing and labor market decisions based in part on the availability of and proximity to public land, like forests, lakes, mountains, etc. Living proximate to public land provides amenities such as convenient access to recreation and wildlife viewing, as well as disamenities such as crowds, litter, and noise. That is, population movement and migration into environmentally desirable areas, like Sierra County and surrounding counties, can be explained by the presence of, and density of, natural resources and associated environmental amenities. Additionally, housing prices in the Southwest are higher based on overall proximity and access to public land (Hand et al. 2008).

Although economic conditions are changing in the local community, outdoor recreational resources continue to be perceived as linked to local economic well-being. The scenic resources (including NM-152); arid, moderate climate; dark skies; and outdoor opportunities in the area often attract retirees and those looking for second homes. Activities drawing people to the area include boating; fishing; dispersed camping; use of RV parks; golfing; hunting; OHV use; picnicking; sightseeing; driving along scenic backcountry byways; and hiking. Landscape appearance and scenery can be important public land amenities, not just as recreation opportunity settings, but also as elements of the region's identity. Factors such as clean air and water quality, scenery and natural landscape, open space, dark skies, and the number of recreation opportunities can be economic assets themselves for local economies.

3.22.2 Environmental Effects

3.22.2.1 Proposed Action

The analysis for socioeconomics evaluates the social and economic effects, both adverse and beneficial, of the permitting, construction, operation, and reclamation phases of the Proposed Action.

As noted earlier, the ROI for the socioeconomic analysis is defined as Sierra County, or the area most likely to be affected by the proposed project. The community could experience direct, indirect, or induced economic impacts from employment, wages and taxes, etc., as a result of construction and operation associated with the proposed mine, either as a result of permitting, construction, operation, or reclamation. Additionally, the impacts could consist of changes in the quality of life for area residents and visitors due to increased tax revenue.

The temporal bounds for analyzing socioeconomics will be guided in part by available data, an assessment of current conditions (without the proposed mine or associated activity), and the phases of activity associated with the proposed mine (permitting, construction, operation, and reclamation). Operation of the mine would occur over a 16-year period, and while the phases are sequential, there would be some overlap as the activities of an earlier phase continue during the implementation of subsequent phases. The duration and estimated project costs by phase are shown below (NMCC 2014a). (See Table 3-71.)

Table 3-71. NMCC Estimated Project Costs – Proposed Action

Table 3-71. NMCC Estimated Project Costs – Proposed Action		
Description	**Duration (years)**	**Cost (USD)**
Pre-construction/permitting	2	$18,408,000
Construction/site preparation	2	$363,535,000
Mining operations	17	$1,408,196,000
Closure/reclamation	3	$45,398,000
Total	**24**	**$1,835,537,000**

Source: NMCC 2014.

Note: All estimates include resource taxes and exclude income taxes.

A "multiplier" is a number used by economists to determine the impact of a project on the economy. It is the ratio of total change in output or employment to initial change (or direct change). Multipliers are a numeric method of describing the secondary impacts stemming from a change. For example, an employment multiplier of 1.8 would suggest that for every 10 employees hired in a given industry, 8 additional jobs would be created in other industries, such that 18 total jobs would be added to the given economic region.

The economic impacts of the development, operation, and reclamation phases of the proposed project are estimated using the Impact Analysis for Planning (IMPLAN) input-output economic modeling system, originally developed by the Minnesota IMPLAN Group. This type of regional economic modeling is a standard approach to measuring the production and consumption linkages in an economy between households, industries, and institutions (such as government), thus providing an estimate of the "ripple" effects in an economy associated with a direct stimulus or investment.

The multipliers of IMPLAN measure these downstream or ripple effects. The IMPLAN database includes multipliers for 440 industries (including mining). The multipliers in IMPLAN are defined as the sum of the direct, indirect, and induced effects divided by the direct impact. (See Table 3-72.) In the IMPLAN model, businesses produce goods to sell to other businesses, consumers, governments, and purchasers outside the region. The output is produced using labor, capital, fuel, and intermediate inputs. The demand for labor, capital, and fuel per unit of output depends on their relative costs.

The IMPLAN model estimates the direct effects of spending for development activities and consumption spending of new residents and construction workers; the indirect effects of local vendors providing goods and services to the primary firms; and the induced impacts of employees of these firms spending a portion of their earnings in the local economy. Economic activity is measured in terms of income and employment generated (or lost) due to the Proposed Action. With increased spending, many different sectors of the economy benefit, not only the directly impacted sector but also many sectors indirectly. All sides of the cost-benefit analysis are analyzed, including costs to the local community and surrounding area as well as benefits the mine would bring.

Table 3-72. IMPLAN Definitions

Table 3-72. IMPLAN Definitions	
Impact Type	**Definition**
Direct	The set of expenditures applied to the predictive model (i.e., I/O multipliers) for impact analysis (i.e., a $10 million dollar order is a $10 million dollar direct effect).
Indirect	Expenditures within the study region on supplies, services, labor, and taxes.
Induced	Money that is re-spent in the ROI as a result of spending from the indirect effect.

Source: Minnesota IMPLAN Group 2012.

Each of these steps (direct, indirect, and induced) recognizes an important "leakage" from the economic study region spent on purchases outside of the defined area. "Leakage" is the non-consumptive use of income, including savings, taxes, and imports that "leak" out of the main flow between output, factor payments, national income, and consumption. Eventually these leakages would stop the cycle (MIG 2012).

Equipment and materials would be procured locally to the extent possible, but specialized equipment and materials required for copper mining are not available locally. Such items would be shipped from other areas. The economic analysis completed by NMCC and tax consultants for the feasibility study indicates that approximately 15 percent of construction phase costs, or approximately $55 million, would be spent in Sierra County (NMCC 2014c). The IMPLAN model is adjusted to capture costs that would be spent in Sierra County during the construction phase.

NMCC anticipates hiring over 70 percent of the workforce from local communities. The portion of labor hired locally would be highly dependent on the skill levels of the local labor force at the time of hiring for the construction phase and the applicability of these skills moving into the operations phase. NMCC is working with the local community to identify skills anticipated for operations to allow interested individuals to prepare for enhancing their skill set (NMCC 2014b). Preparation for potential mine workers is discussed below in the "Education" section. The IMPLAN model is adjusted to capture employee compensation that would occur in Sierra County. It should be noted that the mining industry, like many industries, is affected by market forces such as supply, demand, and the rising and falling prices of mineral commodities. This analysis does not capture potential mining operational changes in response to market forces.

Projected population increases as they relate to schools, quality of life, and housing are based on the number of direct jobs anticipated during the construction and operation phases. A quantitative economic evaluation of revenues, expenditures, taxes, and income and costs of utilities and infrastructure is included in Section 3.25, Utilities and Infrastructure.

Implementation of the action alternatives and development of the proposed Copper Flat mine could have direct and indirect impacts to the local (Sierra County) and State economies in terms of employment, government revenues, personal income, business sales, and quality of life. Results are expressed in terms of employment (annual average full- and part-time jobs); wages and salaries or labor income (total payroll costs, including benefits); total economic activity (total value of production); and direct taxes. All results are expressed in 2014 dollars and are not adjusted for inflation.

3.22.2.1.1 Mine Development/Operations

Pre-Construction/Permitting: The period from 2014 to 2016 is assumed for the permitting phase, and costs are estimated at $18.4 million (NMCC 2014a). Approximately $15.9 million of the pre-construction/permitting costs occurred in 2014; approximately $1.67 million occurred in 2015; and an estimated $838,000 will occur in 2016. The pre-construction/permitting phase would generate over $15 million in total economic activity; support almost 250 direct, indirect, and induced jobs from 2014 to 2016 – translating to over $13 million in labor income.

The permitting phase would support 175 full- and part-time direct jobs and $11.4 million in labor income from 2014 to 2016. Of the 175 direct jobs supported during this 3-year period, 152 of those occurred in 2014. The 175 full and part-time jobs would be generated mostly in the environmental and other technical consulting services sector. Note that a direct employment effect does not necessarily represent direct employment by NMCC during this phase. Activities performed in this sector could include legal advice and representation; accounting, bookkeeping, and payroll services; architectural, engineering, and specialized design services; surveying and mapping services; consulting services; research services; and other professional, scientific, and technical services.

About 21 jobs (indirect) would be generated through purchases from local businesses. Another 53 jobs (induced) would be generated through the purchases of those receiving income and consequently spending that income locally. Overall economic impacts of the permitting phase by employment, salaries and wages, and economic activity are presented below. (See Table 3-73.)

Table 3-73. Economic Impacts of Permitting Phase in Sierra County – Proposed Action

Table 3-73. Economic Impacts of Permitting Phase in Sierra County – Proposed Action			
Impact Type	**Employment**	**Labor Income**	**Value Added**
Direct effect	175	$11,408,052	$11,456,789
Indirect effect	21	$613,451	$982,044
Induced effect	53.2	$1,398,719	$2,987,959
Total Effect	**249**	**$13,420,222**	**$15,417,792**

Source: Calculations using IMPLAN PRO Version 3.

Construction/Site Preparation: Impacts associated with the construction of the mine facilities would be a one-time event. Construction of the project is planned to occur from 2016-2018, though most construction activity would occur in 2017. The impact scenario was constructed based on the peak number of construction jobs and annual construction costs. Total construction costs are estimated to be $363.5 million, of which approximately $55 million would be spent in Sierra County (NMCC 2014c). Most of the initial investment of $101.5 million for mobile and fixed plant equipment would occur outside of Sierra County (some within the State, some not), so these expenditures are not considered in the impact analysis. Dollar impacts are presented in 2014 (constant) dollars and are not adjusted for inflation. (See Table 3-74.)

Table 3-74. Economic Impacts of Construction Phase in Sierra County – Proposed Action

Table 3-74. Economic Impacts of Construction Phase in Sierra County – Proposed Action			
Impact Type	**Employment**	**Labor Income**	**Value Added**
Direct Effect	221	$10,523,194	$20,170,889
Indirect Effect	25	$885,317	$1,396,175
Induced Effect	50	$1,306,941	$2,753,525
Total Effect	**296**	**$12,715,452**	**$24,320,590**

Source: Calculations using IMPLAN PRO Version 3.

The construction phase includes wholesale purchases of mining equipment, payments to construction firms, payments for outside services, and purchases of fuels, electricity and supplies. Despite the $363.5 million that would be spent during the construction phase, the number of jobs directly supported and the associated labor income is relatively low. The reason for the disparity between expenditure figures and the economic impacts is that the expenditure categories registering the largest gains (e.g., wholesale purchases of mining equipment and fuels and petroleum products) have small local economic impacts per $1 million of spending compared to service sectors. Mining equipment may be purchased from wholesalers in New Mexico but is produced entirely out of State.

Indirect impacts result from directly impacted industries purchasing supplies and materials from other industries. Indirect jobs include local vendors from whom NMCC would make purchases and local retail stores and establishments where Copper Flat employees would shop. Induced impacts occur when employees of the directly and indirectly affected industries spend the wages they receive. The indirect and induced jobs created during construction and operation phases are often relatively low-wage jobs such as restaurant workers or convenience store clerks.

Mining Operations: The IMPLAN model was customized to incorporate a sector for copper mining that does not currently exist in Sierra County. No mining has taken place in Sierra County since the early 1980s. The introduced mining sector used multipliers based on national per-worker values for the copper mining industry and adjusted for project specifics. The IMPLAN impact scenario was constructed based on knowing the annual operating costs and workforce. While expenditures in Sierra County have some effect on the rest of the State and expenditures in the rest of the State have some effect on Sierra County, this analysis does not estimate these interactions.

The operations phase would create over $1.1 billion in total economic activity; support over 3,300 direct, indirect, and induced jobs over a period of 16 years; and provide over $262 million in labor income. (See Table 3-75.) Labor income captures all forms of employment income, including wages and benefits. The increase in economic activity in the local economy, or the value added to the local economy, represents the wealth created by the industry activity (i.e., mining).

Table 3-75. Economic Impacts of Operation Phase in Sierra County – Proposed Action

Table 3-75. Economic Impacts of Operation Phase in Sierra County – Proposed Action			
Impact Type	**Employment**	**Labor Income***	**Value Added**
Direct Effect	2,165	$229,506,397	$1,070,179,831
Indirect Effect	192	$6,739,617	$12,666,235
Induced Effect	985	$26,010,211	$54,778,017
Total Effect	**3,341**	**$262,256,225**	**$1,137,624,082**

Source: Calculations using IMPLAN PRO Version 3.

Note: *Includes wages and benefits.

The Copper Flat mine would directly generate over 2,100 full and part-time jobs during the 16-year operations phase, including mine workers, administration, and maintenance personnel. (See Table 3-75.) Average direct employment in Sierra County by the mine would be about 127 employees per year. Workers in Sierra County would experience a roughly $230 million increase in labor income (including benefits), or an average of $13.5 million per year. Peak yearly impacts would occur in 2018, 2019, and 2020 (years 3, 4, and 5 of operations); and coincide with the highest annual operating cost(s). Direct employment in peak years would vary between 248 and 285; and compensation would vary between $24.4 and $27 million during these 3 years.

Overall, the average annual payroll of Copper Flat employees would contribute significantly to the total wages and salaries in Sierra County. When using an average of $13.5 million in annual payroll, approximately 80 percent is actually “take home” pay, and the other 20 percent goes toward workers’ compensation, health insurance, unemployment, and Social Security. Thus, approximately $10.8 million would flow into local economies where employees reside. If 70 percent of the Copper Flat employees live in Sierra County, the total wages and salaries would represent a maximum of 7.5 percent of total employee compensation in Sierra County based on 2010 employee compensation. (See Table 3-62.)

These workers would represent new purchasing power that would support additional jobs and payroll at local retail and service establishments in Sierra County. Unlike basic industries that export most products, local retailers and service establishments recycle money within the local economy. NMCC would make purchases from local vendors and NMCC employees would shop at local establishments. These local vendors and their employees in turn would make additional local purchases. The total impacts include both the direct and secondary impacts created by other local businesses and their employees. Purchases by both NMCC and its employees outside of Sierra County are not represented here. As discussed above, the IMPLAN database includes multipliers for 440 industries (including mining) to measure these downstream or ripple effects. A multiplier is the ratio of total change in output or employment to initial change (or direct change). There is a larger multiplier effect associated with the consumer spending of workers directly supported by mining operations. Through this spending, Copper Flat mine would indirectly support almost 1,200 indirect and induced jobs.

IMPLAN does not estimate tax impacts using rates or levies, but rather uses the actual tax collected by the government for the year of the data set. These indirect business taxes, or the taxes on production and imports, are then distributed among the various tax types (e.g., property, severance) based on the State's distributions as defined by the Annual Census of Government Finances. Since sectors for copper mine development and operations did not previously exist, IMPLAN estimates proprietor income, other property type income, and tax on production and imports using national averages. Due to the specificity of the severance and property tax code(s) as it relates to a copper mine in New Mexico, impacts from IMPLAN are not reported here.

Further, while the model estimates other property income (OPI) – corporate profits, capital consumption allowance, payments for rent, dividends, royalties and interest income – these are not considered direct impacts. IMPLAN treats OPI as a leakage (i.e., OPI is not spent in Sierra County and thus does not generate any additional impacts), since it is impossible to model where or how much shareholders would spend or reinvest. Advance royalty and Net Smelter Royalty payments would be made to Hydro Resources, Cu Flat LLC, and GMC after NMCC has received the State and Federal permits required for commercial operation of the mine but before mineral products are sold. Since royalty payments would not be made to any State or Federal entity, impacts to the local economy and residents of Sierra County would be negligible. As such, royalties are not discussed further. Tax impacts are calculated separately and discussed below under “Direct Taxes.”

3.22.2.1.2 Mine Closure/Reclamation

The 3-year reclamation phase would begin during the last year of operation – theoretically, in 2033. However, IMPLAN data is not available past 2030. As such, the estimated impacts from this phase may be overstated. The impact scenario was constructed based on knowing the annual operating costs for this phase. Hazardous and chemicals materials and reagent management; removing surface facilities; plugging drill holes and water wells; recontouring the disturbance area; and reestablishing vegetation for grazing would directly support 162 direct jobs. Unlike the development and operation phases, due to the nonspecialized workers needed for reclamation, the majority of jobs could be filled by the local labor force. More than $25 million in economic activity would result from this phase. (See Table 3-76.)

Table 3-76. Economic Impacts of Reclamation Phase in Sierra County – Proposed Action

Table 3-76. Economic Impacts of Reclamation Phase in Sierra County – Proposed Action			
Impact Type	**Employment**	**Labor Income***	**Value Added**
Direct Effect	162	$11,413,646	$21,281,855
Indirect Effect	31	$1,034,475	$1,666,336
Induced Effect	51	$1,358,069	$2,848,471
Total Effect	**244**	**$13,806,190**	**$25,796,661**

Source: Calculations using IMPLAN PRO Version 3.

Note: *Includes wages and benefits.

In contrast to the operation phase, the reclamation phase would directly support the waste management and remediation services sector (as opposed to the copper mining sector), which would enjoy the majority of the increased labor income. (See Table 3-76.) However, the reclamation phase would also create additional labor income in the food service and healthcare sectors.

A reclamation bond is required by the BLM and State of New Mexico to guarantee the completion of Project reclamation. Following regulatory review of the proposed plan of operations and reclamation techniques presented herein, NMCC will prepare, at a time specified by the BLM [43 CFR 3809.401(d)], a detailed estimate of the cost to fully reclaim the operations as required by 43 CFR 3809.552. This reclamation plan would be administered by the NMEMNRD MMD and the NMED -- Mining Environmental Compliance Section. Financing will include a mix of equity and debt, but the ratio will depend on market conditions, interest rates, and other factors that will continue to vary over the course of project development. In negotiating specific arrangements for the proposed project, factors such as the operator's financial condition, track record, and management systems will likely affect the terms of financial assurance the government will require to give it a feeling of reasonable certainty (ICMM 2005). While dependent on the resulting amount and terms of financial assurance, mitigation measures are proposed to ensure funding would be available to completely cover reclamation costs.

3.22.2.1.3 Public Finance

Direct Taxes: NMCC provided estimates of direct tax liabilities under the Proposed Action, direct tax costs by year are summarized below. (See Table 3-77.) The copper ad valorem, severance, and processors taxes paid directly to the State would be over $18 million during the construction, operation, and reclamation phases (NMCC 2014a).

Tax estimates provided in Table 3-77 assume metal prices of $3.00/lb for copper; $9.50/lb for molybdenum; $1,350/oz. for gold; and $22/oz. for silver. Ultimately, State and local tax revenue would be proportional to copper, molybdenum, gold, and silver prices for that year. Additionally, because of the shared distribution of severance taxes throughout the State (80 percent to the State general fund and 20 percent to counties and municipalities), the portion of severance taxes paid to Sierra County and municipalities would only equate to a portion of the total severance taxes generated as a result of the mine.

Table 3-77. Direct Taxes by Year – Proposed Action

Table 3-77. Direct Taxes by Year – Proposed Action				
Year	**Copper Ad Valorem Tax ($000)**	**Severance Tax ($000)**	**Processors Tax ($000)**	**Transportation Cost ($000)**
Construction/Site Preparation				
2016	-	-	-	-
2017	-	-	-	-
Operation/Minerals Beneficiation				
2018	765	139	545	13,631
2019	813	148	591	14,323
2020	796	145	581	13,917
2021	723	131	508	13,150
2022	699	127	495	12,552
2023	625	114	457	11,034
2024	610	111	448	10,678
2025	566	103	419	9,789
2026	500	90	353	8,899
2027	477	86	341	8,366
2028	472	85	333	8,366
2029	519	93	356	9,255
2030	559	101	383	10,073
Closure/Reclamation				
2031	560	101	383	-
2032	594	108	431	-
2033	433	78	316	-
Total	**$9,711**	**$1,759**	**$6,940**	**$143,988**

Source: NMCC 2014.

Indirect Taxes: A buyer's GRT liability may be reduced through the use of Industrial Revenue Bonds (IRB), an economic development tool that assigns the county's tax exemption status to the issuer. The IRB would be issued by Sierra County to offset the New Mexico GRT obligations towards certain tangible personal equipment which includes eligible equipment and machinery to be installed and operated at the mine. Under the authority of the County Industrial Revenue Bond Act (Ch. 4, Art. 59, New Mexico Statues Annotated), Sierra County would be the legal purchaser and owner of the IRB property; in turn leasing the property back to the issuer. In this case, NMCC would essentially acquire the tax status of the county, becoming exempt from compensating tax and GRT on purchases of eligible mining and processing equipment.

NMCC has identified IRB-qualifying equipment proposed for the operation, and analyzed the proposed capital expenditure list in order to develop an appropriate GRT rate to apply to the economic model. Following this review, an effective GRT rate of 4.30 percent was applied to project capital as an overall average to include the use of IRBs and applicable GRT and compensating tax rates. NMCC is continuing efforts with the external consultants to finalize issuance of the IRB. This effort will also require participation and agreement of Sierra County officials. GRT and compensating taxes are not direct tax revenues to Sierra County, and as such any exemption would have indirect impacts to Sierra County (NMCC 2013).

Mining companies generate a large amount of tax revenue, due partly to the high business taxes they pay and partly because their employees, being highly compensated, also pay high taxes. Provision of government services is a relatively labor intensive activity. A given quantity of dollars spent on government services supports a relatively large number of jobs. Industries with per employee tax contributions that exceed the statewide average are likely to be making a net fiscal contribution to the State. The companies and their employees pay in taxes an amount that exceeds the value of the services they receive, with the difference serving to subsidize the provision of public services to other residents of the State (AMA 2012).

3.22.2.1.4 Population and Housing

NMCC anticipates hiring over 70 percent of the workforce from communities within a 75-mile radius of the mine; some employees would commute from counties adjacent Sierra County. With a total population of 11,988, a labor force of 5,923, and an unemployment rate of 6.2 percent in 2010, Sierra County would only fill a portion of mining jobs needed for all phases of the proposed project. Current plans do not exist to develop nearby temporary housing. NMCC plans to keep the public and relevant parties informed about timing related to project milestones, and to rely on the market to fill the need (NMCC 2012).

Construction workers are expected to commute to the project area from their residences rather than relocate, and typically commute up to 2 hours one way for a job, or an average of 73 miles and maximum of 115 miles one way (Gilmore et al. 1982). Assuming that any construction workers relocating to the area would relocate to Sierra County, and based on New Mexico’s average family size of 3.13 individuals, the population is expected to grow at least temporarily by approximately 100 individuals over the duration of the construction phase. The housing vacancy rates in Sierra County was almost 30 percent in 2010, with over 2,400 housing units unoccupied (USCB 2010). There would be minimal demands on the local housing supply during this timeframe.

During the operation phase, direct impacts to population in the analysis area would result from approximately 30 percent of employees relocating to the region either temporarily or permanently, including staying in hotels/motels, apartments, or purchasing a home. Assuming that operation workers relocating to the area would relocate to Sierra County, the population is expected to grow permanently by approximately 120-270 individuals (including families) over the duration of the operation phase.

Again, considering the significant number of vacant housing units, and with most of the construction workforce expected to commute to the project area rather than relocate, little or no transient housing would be required in the project area or in the communities closest to the project area. Those who relocate would have ample housing options in Sierra County, and in-migration would help offset local housing vacancies.

3.22.2.1.5 Community Services

Law Enforcement: The number of law enforcement officers (14) and firefighters (179) currently serving Sierra County are presented in Table 3-66. Assuming an increase of about 200 individuals (including families), project-related increases in population would raise the ratio of residents to law enforcement officers and residents to firefighters by less than 1 percent. Since most firefighting and law enforcement units in Sierra County share mutual aid agreements with surrounding counties that allow cross-coverage for emergencies, it is unlikely that the overall increase in population would cause law enforcement and firefighting to become overwhelmed. Should additional law enforcement officers be needed, at least a portion of the funding would be compensated for by the anticipated increased tax revenues arising from the proposed project. Unincorporated Sierra County has a volunteer firefighting staff, but municipalities in the county have professional fire departments. Should paid firefighter staff be needed in municipalities or unincorporated Sierra County, the anticipated increase in tax revenue arising from the proposed project could mitigate the small impact by facilitating the hiring of firefighters.

Health Services: Existing medical services are characterized as one staffed hospital bed per 480 residents of Sierra County. The combined increase in population in Sierra County would increase the staffed bed to person ratio to 1:488. An additional 748 staffed hospital beds in surrounding counties are available to Sierra County residents, but residents would visit Sierra Vista Hospital in an emergency situation.

The proposed mine would create significant indirect and induced jobs and associated salaries in the healthcare sectors, including private hospitals; offices of physicians, dentists, and other health practitioners; nursing and residential care facilities. Given that Sierra County is a health professional shortage area, any increase in population would further strain the existing medical services. Increased tax revenues could facilitate retaining existing staff and hiring new staff at publicly-funded medical facilities.

Schools: Based on the number of children under the age of 5 years, and a projected increase in enrollment at a rate of 2.4 percent per year on average, Truth or Consequences Elementary School is expected to be over-capacity starting in the sixth year of operation of the proposed project. While some students could attend Arrey Elementary School, which could accommodate at least 130 additional students pre-K-5, or Sierra Elementary Complex, which could accommodate at least 35 students in grades 4-5; Truth or Consequences Elementary School is the main facility available for students pre-K-3. If needed, increased local and county revenue from property, copper ad valorem, severance, and GRT taxes could contribute to capital improvements to expand capacity at the Truth or Consequences Elementary School or to hire additional staff.

3.22.2.1.6 Community Cohesion and Quality of Life

Community Cohesion: Many of the potential social impacts associated with the proposed project are closely tied to boom and bust mining economies. The introduction of a transient workforce population into an established community often changes the social functioning of that community, resulting in increases in the consumption of alcohol, illegal drugs, and misuse of prescription drugs. Subsequently, there may be increases in violence, crime, injury, chronic disease, and mental well-being associated with alcohol and substance misuse. The increases in alcohol and drug use arise from a combination of factors that include increased disposable income, changing family roles, and increased stress among local residents (Mucha 1978). If jobs and income increase social or economic disparity in a region, this could have adverse health impacts across the entire population.

The proposed project could adversely impact the social fabric of the local community. In the past, communities that have become specialized in mining go through cycles of economic expansion followed by economic collapse. These cycles can stress families and tend to tear the social fabric of communities as workers have to commute out of the area to work or they and their families have to relocate (Power 2008).

Recreation and Tourism: Given that self-generated receipts at state parks are closely linked to outdoor water-based activities, the existence of an open-pit copper mine could adversely impact revenue and visitation. The negative perception of impacts to natural amenities from mining – especially to water quantity and water quality, wildlife, and air quality – that attract recreationists in the first place could be a deterrent in both the short- and long-term. The Copper Flat mine project area has already been developed, or graded and cleared for mining purposes. Additional tree removal for additional haul roads and the construction of facilities would contribute minor adverse impacts to recreation in the area based on the increased degradation of visual quality.

As noted in Section 3.16, Recreation, the Geronimo Trail Scenic Byway offers scenic views of the Black Range Mountains, Caballo Mountains, Caballo Lake, and Gila National Forest. The extent to which an active mine would deter tourists or recreationists from travelling this byway is difficult to quantify. However, it is likely that during the 1- to 2-year construction period, some may avoid the portion of NM-152 (from Hillsboro east to the junction of NM-152 and Highway 85), where the Geronimo Trail Scenic Byway and the Lake Valley Backcountry Byway overlap, due to the perception of increased traffic and air emissions hindering their experience. Visitation at the Gila National Forest in the western edge of Sierra County may decrease during this time since the Black Range Ranger Districts (including the Gila Wilderness) is most easily accessed via NM-152. NM-152 is one of three routes providing access to the Wilderness Ranger District; and one of six to the Silver City Ranger District. Economic benefits derived from direct spending on food, gas, lodging, etc., as well as GRTs generated from visitor spending would also be affected.

Additionally, the portion of the Geronimo Trail Scenic Byway that follows NM-152 is located in a former mining area, which promotes tourism through sightseeing tours of abandoned mines and ghost towns. While some tourists may be deterred due to the perception of increased traffic and air quality or the degradation of visual quality, some may instead be drawn to the area. The Copper Flat mine project could create or renew interest in nearby ghost mining towns, the mining process, and the evolution of mining in the area; and benefit tourism.

Quality of Life and Recreational Values: Assuming that people value proximity to Elephant Butte Lake State Park, parts of the Gila and Cibola National Forests, the Black Range Mountains, Turtleback Mountain, and the banks of the Rio Grande and its resources; the existence of an open-pit copper mine would negatively impact the value of neighboring properties. National forests that continue to be accessible without fees or undue restrictions are valued as contributing to recreation opportunities and enhancing the overall quality of life in the region. The impacts to (or the perception of impacts to) natural amenities that attract retirees and others to relocate to the area could be a deterrent in the long-term.

As stated earlier, the relationship between mining projects and recreation is unclear. Based on the potential impacts (or perception of impacts) on air quality, water resources, recreation, wildlife, transportation, and noise, the proposed project could deter retirees, tourists, and recreationists looking to enjoy Sierra County's natural amenities. That said, the Proposed Action would diversify the industry base as well as provide other employment opportunities, satisfying one of the types of needed economic development noted in the Sierra County Comprehensive Plan (SCCP 2006).

In conclusion, the Copper Flat mine would potentially create significant beneficial impacts of major magnitude due to the creation of jobs, labor income, and tax revenues. Overall, the proposed mine would support over $1.2 billion in economic activity, about 4,100 jobs with salaries worth over $300 million, and generate $18.4 million in local and State revenue during the life of the project. The extent of impacts would be medium (localized) to large, since most of the jobs would be filled by area residents but a portion would travel from outside of the economic region. These impacts are probable, since the relationship between an infusion of capital and direct, indirect, and induced impacts is well-established. Due to operational copper mines in the area with which to compare or base projected impacts, there is moderate confidence in the accuracy of the predictions as to the types, extent, and likelihood of impacts. However, impacts to tax revenue, for example, are dependent on the global price of copper. The precedence and uniqueness of the impact would be minor due to historical copper mining at the same location as well as active copper mines in the nearby Grant and Catron counties.

Although the Proposed Action would yield tangible, major economic benefits for Sierra County in the long term, the socioeconomic impact of this mine remains controversial due to the historical boom and bust cycles that have occurred in the region and elsewhere. Many historical and current mining areas are synonymous with lagging economies, due to the instability or volatility of mining jobs and earnings (which is tied to the global price of copper). High wages and regular layoffs contribute to unemployment, with workers remaining in the local area hoping to be rehired. Recreational amenities from public land are economic assets that can help attract and retain people and their business. A sufficiently educated workforce, a more diverse economy, and ready access to larger population centers via road and air travel also play key roles in enabling areas to maximize the benefits of public land; the relationship between the mining and tourism sectors is unclear. Sierra County's ability to promote amenities as well as retain migrants and businesses from the proposed mine would ultimately determine the long-term size, health, and diversity of the economy.

3.22.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The Accelerated Operations Alternative proposes to increase material processing at the mine from 17,500 tpd to 25,000 tpd or 9,125 kilotons per year (ktons/yr). Economic impacts discussed under Alternative 1 are compared to those discussed under the Proposed Action. Potential impacts to population and housing; community services (including law enforcement, health services, schools); and community cohesion and quality of life would be similar to those discussed under the Proposed Action and are therefore not discussed further.

Project costs under Alternative 1 would be equal to those under the Proposed Action for the permitting, construction, and reclamation phases. Operation of the mine would occur over an 11-year period as opposed to a 16-year period under the Proposed Action. The cost of operations would be lower than under the Proposed Action and the duration would be 6 years shorter. The IMPLAN impact scenario for the operation phase under Alternative 1 was adjusted to reflect the aforementioned information as compared to the Proposed Action. Estimated project costs are shown below. (See Table 3-78.)

Table 3-78. NMCC Estimated Project Costs – Alternative 1

Table 3-78. NMCC Estimated Project Costs – Alternative 1		
Description	**Duration (years)**	**Cost (USD)**
Pre-construction/permitting	2	$18,408,000
Construction/site preparation	1.5	$363,535,000
Mining operations	11	$1,305,412,000
Closure/reclamation	3	$45,398,000
Total	**17.5**	**$1,732,753**

Source: NMCC 2014.

Note: All estimates include resource taxes and exclude income taxes.

3.22.2.2.1 Pre-Construction/Permitting

The overall cost, cost per year, and calendar year of the permitting phase are the same for the Proposed Action and Alternative 1. As such, impacts do not differ from those discussed under the Proposed Action.

3.22.2.2.2 Construction/Site Preparation

The overall cost, cost per year, and calendar year of the construction phase are the same for the Proposed Action and Alternative 1. As such, impacts do not differ from those discussed under the Proposed Action.

3.22.2.2.3 Mining Operations

Under Alternative 1, the operations phase would create over $1 billion in total economic activity and support 3,100 direct, indirect, and induced jobs over a period of 11 years. (See Table 3-79.) Overall, Alternative 1 would create about 175 fewer direct, indirect, and induced jobs than the Proposed Action.

Table 3-79. Economic Impacts of Operation Phase in Sierra County – Alternative 1

Impact Type	Employment	Labor Income	Value Added
Direct effect	2,078	$220,306,831	$1,027,282,854
Indirect effect	168	$5,891,152	$11,329,585
Induced effect	916	$24,206,710	$50,977,531
Total Effect	**3,162**	**$250,404,692**	**$1,089,589,970**

Source: Calculations using IMPLAN PRO Version 3.

Under Alternative 1, the Copper Flat mine would directly generate over 2,000 full and part-time jobs during the operations phase. Average direct employment would be about 189 employees per year compared to 127 per year under the Proposed Action (due to the shorter duration of the operations phase). While the overall increase in direct labor income (including benefits) would be about $10 million higher under the Proposed Action, under Alternative 1 the average labor income per year is about $6.5 million higher. The magnitude, duration, and timeframe of peak yearly impacts to employment and labor income would be similar for the Proposed Action and Alternative 1; peak annual operating costs would also occur in 2018, 2019, and 2020. Peak yearly impacts and peak annual employment would occur in 2018, 2019, and 2020 and coincide with the highest annual operating cost(s). Peak employment under Alternative 1 would vary between 315 and 357 in 2018, 2019, and 2020, and correspond to compensation between $31 and $33.7 million for these 3 years.

3.22.2.2.4 Closure/Reclamation

While the total and annual cost of the reclamation phase is the same for the Proposed Action and Alternative 1, the activities would occur in different calendar year(s). However, since IMPLAN data is not available past 2030, the estimated impacts to employment, labor income, and value added do not differ substantially.

3.22.2.2.5 Direct Taxes

NMCC provided estimates of direct tax liabilities under the Proposed Action, and Table 3-80 summarizes the direct tax costs by year. The copper ad valorem, severance, and processors taxes paid directly to the State under the Proposed Action and Alternative 1 would be very similar; and equal about 18.5 million under Alternative 1 or about $80,000 higher (NMCC 2014a). Transportation costs are about 15 percent higher under Alternative 1, but since the processors and severance taxes are calculated net of deductions the overall taxes are not much affected.

Table 3-80. Summary of Tax Revenue – Alternative 1

Table 3-80. Summary of Tax Revenue – Alternative 1	
Tax	**Amount ($)**
Copper Ad Valorem Tax	$9,756,000
Severance Tax	$1,768,000
Processors Tax*	$6,969,000
Total	**$18,493,000**

Note: *Net of Transportation Costs and Royalties.

3.22.2.2.6 Conclusion

Overall impacts would be similar to those discussed under the Proposed Action. The annual increases in labor income would be higher under Alternative 1, because employment would be concentrated over a shorter period. However, this alternative would create the fewest number of direct, indirect, and induced jobs due to the comparatively short duration of the operations phase; though the associated labor incomes and value added to the economy would be similar to those under the Proposed Action.

3.22.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

As with Alternative 1, potential impacts to population and housing; community services (including law enforcement, health services, schools); and community cohesion and quality of life would be similar to those discussed under the Proposed Action and are therefore not discussed further.

Project costs under Alternative 2 are the same for the permitting, construction, and reclamation phases under the Proposed Action and Alternative 1. The cost of the operations phase would be higher than under the Proposed Action, but the duration (and therefore the timing) of the phases would be different. The IMPLAN impact scenario for the operation phase under Alternative 2 was adjusted to reflect the aforementioned differences to the Proposed Action. Similar to Alternative 1, the estimated operational life of the mine is shorter, 11 years instead of 16. (See Table 3-81.)

Table 3-81. NMCC Estimated Project Costs – Alternative 2

Table 3-81. NMCC Estimated Project Costs – Alternative 2		
Description	**Duration (years)**	**Cost (USD)**
Pre-construction/Permitting	4-5	$18,408,000
Construction/Site Preparation	1-2	$363,535,000
Mining Operations	11	$1,525,285,000
Closure/Reclamation	3	$45,398,000
Total	**19-21**	**$1,952,626,000**

Source: NMCC 2014.

Note: All estimates include resource taxes and exclude income taxes.

3.22.2.3.1 Pre-Construction/Permitting

The overall cost, cost per year, and calendar year of the permitting phase are the same for the Proposed Action and Alternative 1. As such, impacts do not differ from those discussed under the Proposed Action.

3.22.2.3.2 Construction/Site Preparation

The overall cost, cost per year, and calendar year of the construction phase are the same for the Proposed Action and Alternative 2. As such, impacts do not differ from those discussed under the Proposed Action.

3.22.2.3.3 Mining Operations

Under Alternative 2, the operations phase would create approximately $1.8 billion in total economic activity and support more than 5,200 direct, indirect, and induced jobs over a period of 11 years; compared to $1.1 billion in total economic activity and over 3,300 direct, indirect, and induced jobs under the Proposed Action. (See Table 3-82.)

Table 3-82. Economic Impacts of Operation Phase in Sierra County – Alternative 2

Table 3-82. Economic Impacts of Operation Phase in Sierra County – Alternative 2			
Impact Type	**Employment**	**Labor Income**	**Economic Activity**
Direct Effect	3,440	$364,651,777	$1,700,357,634
Indirect Effect	273	$9,568,219	$18,473,030
Induced Effect	1,506	$39,762,642	$83,736,506
Total Effect	**5,218**	**$413,982,638**	**$1,802,567,171**

Source: Calculations by Author using IMPLAN PRO Version 3.

Alternative 2 would create almost 1,300 more direct jobs than would the Proposed Action; and almost 1,900 more direct, indirect, and induced jobs overall. Average annual direct employment by the mine for Alternative 2 would also be higher than the Proposed Action over the operations phase – about 287 employees per year compared to 127 per year under the Proposed Action. Mine workers in Sierra County would experience a roughly $365 million increase in labor income (including benefits) during the operations phase, or an average of about $30.4 million per year – about $16.9 million more per year than the Proposed Action. Peak yearly impacts would occur in 2018, 2019, and 2022, in line with the highest annual operating costs for this alternative. Direct employment in peak years (2018, 2019, and 2022) would vary between 335 and 387 and compensation in these peak years would vary between $34.3 and $36.6 million.

3.22.2.3.4 Closure/Reclamation

The overall cost, cost per year, and calendar year of the reclamation phase are modeled the same for the Proposed Action and Alternative 2. Because IMPLAN cannot incorporate activities planned past 2030, impacts do not differ from those discussed under the Proposed Action.

3.22.2.3.5 Direct Taxes

NMCC provided estimates of direct tax liabilities under the Proposed Action, and Table 3-83 summarizes the different direct taxes that would be levied on NMCC. Compared to the Proposed Action, the copper ad valorem, severance, and processors taxes paid directly to the State would be higher under Alternative 2. Transportation costs are about 40 percent higher under Alternative 2 – over $200 million.

Table 3-83. Summary of Tax Revenue – Alternative 2

Table 3-83. Summary of Tax Revenue – Alternative 2	
Tax	**Amount ($)**
Copper Ad Valorem Tax	$11,588,000
Severance Tax	$2,099,000
Processors Tax*	$8,325,000
Total	**$22,012,000**

Note: *Net of Transportation Costs and Royalties.

In summary, impacts would be similar to those discussed under the Proposed Action. However, the magnitude of both beneficial and adverse impacts would be greatest under this alternative due to the number of direct, indirect, and induced jobs and labor income as well as the associated economic activity in Sierra County. Overall, Alternative 2 would support an additional $700 million in total economic activity and 2,000 jobs compared to the Proposed Action. Given the highest rate of production and therefore gross revenue, the State would collect an additional $3.6 million in direct taxes. That said, economic impacts are still tied to the global price of copper and the potential interruption or termination of copper mining still exists; the magnitude of any potential collapse would therefore also be more severe.

3.22.2.4 No Action Alternative

Assuming that the proposed project is not implemented, no socioeconomic changes would occur to Sierra County. Since ongoing activities would be substantially the same as those already occurring, no significant additional change in community character and setting would be anticipated. Existing conditions would remain substantially unchanged and have no effect on the populations of concern.

There would be no change to population, housing, employment, income characteristics, economic activity, taxes and revenues, or quality of life conditions. Fluctuations or changes would occur at rates consistent with historical trends.

3.22.3 Mitigation Measures

Mitigation activities could enhance the positive effects and minimize negative effects from "boom and bust" mining activity and ensure that Sierra County receives the maximum benefit from the infusion to its local economy. Potential mitigation could include:

- Provide job training programs aimed at developing the skills of the local population to enable employment in the mining industry. While NMCC anticipates hiring over 70 percent of the workforce from local communities, the portion of labor hired locally will be dependent on the skill levels of the local labor force at the time of hiring for the construction phase and the applicability of these skills moving into the operations phase. Such job training program(s) would increase the percentage of local residents filling jobs created by the mine by enabling the local community to identify skills anticipated for operations and allow interested individuals to enhance their skill set.
- Provide benefits package to employees that encourages saving and installation of 401K programs in an effort to reduce the severity of effects from "boom and bust." While the effectiveness of financial education and literacy programs is difficult to measure, most studies find some positive correlation between financial education and financial well-being (Walstad et al. 2010). Financial education has been shown to reduce debt, home foreclosures, bankruptcies (especially medical bankruptcies), and unemployment (Long 2011). The

provision of health care and 401K programs could reduce the severity of effects from the "bust."

- Develop community outreach programs that would help communities adjust to changes triggered by mining, such as establishing vocational training programs for the local workforce to promote development of skills required by the mining industry; supporting community health screenings, especially those addressing potential health impacts related to the mining industry; and providing financial support to local libraries for development of information repositories on copper mining, including materials on the hazards and benefits of commercial development. Electronic repositories established by the operators could also be of great value (TEEIC 2013).
- Develop community monitoring programs that would be sufficient to identify and evaluate socioeconomic impacts resulting from mining. Monitoring programs should collect data reflecting economic, fiscal, and social impacts of the development at both the tribal, State, and local level. Parameters to be evaluated could include impacts on local labor and housing markets, local consumer product prices and availability, local public services (e.g., police, fire, and public health), and educational services. Programs could also monitor indicators of social disruption (e.g., crime, alcoholism, drug use, and mental health) and the effectiveness of community welfare programs in addressing these problems (TEEIC 2013).

The following mitigation opportunities would enhance alternatives' positive effects and minimize negative effects regarding public perception or concern of bankruptcy as indicated by historical trends:

- Analyze options for long-term funding mechanisms and financial assurance (FA) to demonstrate to local community that funding would be available to completely cover the costs of closure and reclamation regardless of NMCC's current or projected financial stability. An effective FA policy has the potential to reduce the scope for public criticism of industry practices.
- Consider other FA strategies as collateral for reclamation bonds in addition to or instead of cash, cash equivalents, and fixed income securities. Examples include irrevocable letters of credit, surety bonds issued by an insurance company, performance bonds, fidelity bonds, trust funds, and insurance policies. If hard assurances would interfere with mine operation, consider the provision of non-cash securities such as pledge of assets and salvage value of plant and equipment. Harder instruments, such as letters of credit, bank guarantees, deposit of securities, and cash trust funds, have been found to best serve the industry as they are required to satisfy public expectations. Total potential liability could be best covered by two instruments: a soft FA (e.g., corporate guarantee) for 75 percent of the total and a hard instrument (e.g., letter of credit) for the remainder. A toolkit approach might also be well-suited (ICMM 2005).
- Consider an insurance policy package that combines three main components: a conventional surety bond, accumulation of cash within the policy, and insurance protection for overruns and for changing requirements. For example, the AIG Environmental Mine Reclamation Policy was used to facilitate a change of ownership for the Jerritt Canyon Mine in Nevada (ICMM 2005).
- Depending on the FA instrument, incorporate an annual true-up cycle into reclamation plan depending on the FA instrument (e.g., cash trust fund), whereby adjustments or "true-ups" are made if NMCC is not meeting growth performance goals. An annual true-up cycle would address both problematic investment performance and the risk of bankruptcy or other corporate failure so that the bond is better positioned to secure the appropriate funds based on performance goals.

- Impose investment limitations/pursue a conservative investment portfolio in the case of a trust fund option. While conservative investment strategies would likely increase NMCC's contribution, given the adverse consequences of bankruptcy, potentially leading to liability for future taxpayers or unacceptable environmental impacts, a conservative approach may be appropriate.

3.23 ENVIRONMENTAL JUSTICE

3.23.1 Affected Environment

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", requires that Federal agencies consider as a part of their action any disproportionately high and adverse human health or environmental effects to minority and low-income populations. Agencies are required to ensure that these potential effects are identified and addressed.

The USEPA defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." The goal of "fair treatment" is not to shift risks among populations, but to identify potential disproportionately high adverse impacts on minority and low-income communities and identify alternatives to mitigate any adverse impacts. For purposes of assessing environmental justice under NEPA, the CEQ defines a minority population as one in which the percentage of minorities exceeds 50 percent or is substantially higher than the percentage of minorities in the general population or other appropriate unit of geographic analysis (CEQ 1997).

As with the socioeconomic impacts analysis, since potential impacts with the greatest magnitude, duration, extent, and likelihood would occur in Sierra County, it is therefore defined as the ROI for any direct and indirect impacts that may be associated with the implementation of the Proposed Action. In addition, impacts are considered for the towns in Sierra County closest to the proposed mine - Truth or Consequences and the Hillsboro Census Designated Place (CDP). For purposes of comparison, the State of New Mexico is defined as the region of comparison (ROC), or the "general population" as it corresponds to the CEQ definition. Demographic and income data for Sierra County (the ROI), including Truth or Consequences and the Hillsboro CDP, is compared to demographic and income data for the State of New Mexico (the ROC) throughout the section. Inclusion of demographic data for the Hillsboro CDP and Truth or Consequences does not change the ROI, since these are located within Sierra County.

3.23.1.1 Minority Populations

The CEQ defines "minority" as including the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic Origin; or Hispanic (CEQ 1997). All figures and calculations are based on demographic profile data from the 2010 Census. (See Table 3-84.)

The CEQ defines a minority population in the following ways:

1. "…If the percentage of minorities exceeds 50 percent... (CEQ 1997)." As this definition applies to the proposed project, if more than 50 percent of the Sierra County population consists of minorities, this would qualify the county as constituting an environmental justice population.
2. "… [If the percentage of minorities] is substantially higher than the percentage of minorities in the general population or other appropriate unit of geographic analysis (CEQ 1997)." For purposes of this analysis, a discrepancy of 10 percent or more between minorities (the sum of all minority groups) in Sierra County and the State of New Mexico would be considered "substantially" higher, and would categorize Sierra County as constituting an environmental justice population. This approach also applies to individual minority groups. A discrepancy of 10 percent or more between individual minority groups (American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic Origin; or Hispanic) in Sierra County and the percentage of individual minority groups in the State of New Mexico would

be considered “substantially” higher, and would categorize Sierra County as constituting an environmental justice population.

Table 3-84. Summary of Minorities and Minority Population Groups

Table 3-84. Summary of Minorities and Minority Population Groups

Location	Total Population	Minority (%)	American Indian & Alaska Native (%)	Black or African American (%)	Asian (%)	Native Hawaiian & Other Pacific Islander (%)	Hispanic or Latino (%)
Hillsboro CDP	124	13.7	3.2	0.0	1.6	0.0	8.9
Truth or Consequences	6,475	31.2	1.9	0.6	0.5	0.0	28.2
Sierra County	11,988	30.5	1.7	0.4	0.4	0.0	28.0
New Mexico	2,059,179	59.2	9.4	2.1	1.4	0.1	46.3

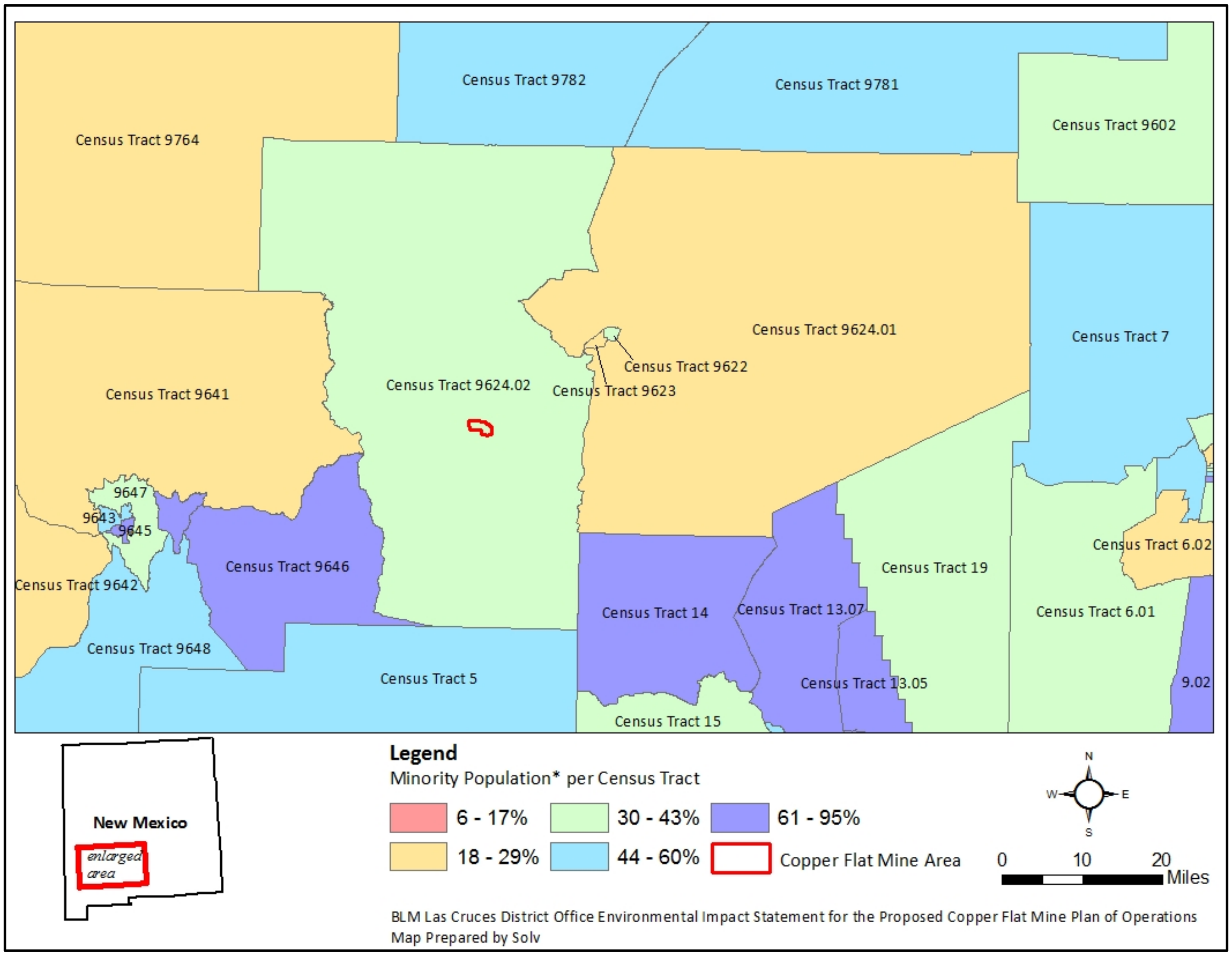
Source: U.S. Census Bureau 2010.

As Table 3-84 indicates, Truth or Consequences, the Hillsboro CDP, and Sierra County do not meet the regulatory definition of consisting a minority population or minority group(s). Minorities in Sierra County, including in the Hillsboro CDP and Truth or Consequences, all represent less than 50 percent of the total population; while minorities represent 59 percent of the total State population. The percentage of each minority population group in Truth or Consequences, the Hillsboro CDP, or Sierra County is lower than the percentage of minority population groups in the State of New Mexico. By both CEQ definitions of a minority population, the ROI does not constitute an environmental justice population.

Pursuant to CEQ’s guidance and due to the site-specific nature of the proposed mine, census tract data is used to identify high concentration “pockets” of minority populations and describe the distribution of minorities in its vicinity (CEQ 1998). It should be noted that although Figure 3-49 and Table 3-85 present census data for a geographic area within the ROI, the ROI does not change and is still defined as Sierra County. Census tracts are small, relatively permanent statistical subdivisions of a county or equivalent entity, generally with a population size between 1,200 and 8,000 people. A census tract usually covers a contiguous area; and its boundaries usually follow visible and identifiable features (USCB 2014).

The proposed mine is located in census tract 9624.02; the percentage of minorities as well as each minority group in census tract 9624.02 is compared to the percentage(s) in the nine surrounding census tracts. Figure 3-49 shows the distribution of minorities in these census tracts.

Figure 3-49. Distribution of Minorities by Census Tract



Source: BLM 2011; ESRI 2010; U.S. Census Bureau 2010.

In census tract 9624.02, minorities represent 38.4 percent of the total population. The percentage of minorities in the immediate vicinity does not exceed 50 percent of the population; therefore, it does not constitute an environmental justice population on this basis.

To determine the percentage of minorities in the nine surrounding census tracts, the aggregate estimate of minorities in each of the census tracts was divided by the total population for the nine census tracts. (See Table 3-85.) In the nine census tracts directly surrounding census tract 9624.02, minorities represent 48.6 percent of the population. The percentage of minorities in census tract 9624.02 is lower than the percentage in the nine surrounding census tracts. As such, census tract 9624.02 does not constitute an environmental justice population on this basis.

Table 3-85. Minority Percentages and Populations by Census Tract

Census Tract (CT)	Total Population	Minorities (%)	American Indian & Alaska Native (%)	Black or African American (%)	Asian (%)	Native Hawaiian & Other Pacific Islander (%)	Hispanic or Latino (%)
9624.02*	2,589	38.4	1.5	0.1	0.3	0.0	36.5
Aggregate of Surrounding CTs	30,607	48.6	2.2	0.5	0.3	0.0	45.5
9623	3,460	29.0	1.7	0.6	0.6	0.0	26.1
9622	3,456	33.1	2.1	0.5	0.3	0.1	30.0
9624.01	2,483	20.7	1.2	0.2	0.4	0.0	18.8
14	5,719	87.4	1.4	0.4	0.4	0.1	85.2
5	4,338	57.0	1.9	0.1	0.2	0.1	53.7
9646	3,060	80.0	2.1	0.4	0.1	0.0	77.4
9641	2,515	24.7	1.7	0.3	0.4	0.0	22.2
9764	3,725	22.3	2.7	0.4	0.2	0.0	19.0
9782	1,851	46.0	8.4	0.7	0.4	0.1	36.5

Source: U.S. Census Bureau 2010.

Note: *Proposed mine located in census tract 9624.02.

3.23.1.2 Low-Income Populations

Low-income populations are defined as households with incomes below the Federal poverty level. There are two slightly different versions of the Federal poverty measure: poverty thresholds and poverty guidelines. The poverty thresholds are the original version of the Federal poverty measure, and are updated each year by the Census. The thresholds are used mainly for statistical purposes - for instance, preparing estimates of the number of Americans in poverty each year. All official poverty population figures are calculated using the poverty thresholds, not the guidelines.

Environmental Justice Guidance Under NEPA suggests that Census poverty thresholds should be used to identify low-income populations (CEQ 1997). The Census uses a set of income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but are updated for inflation. The official poverty definition considers pre-tax income and does not include capital gains or non-cash benefits such as public housing, Medicaid, and food stamps (CEQ 1998).

As displayed below, the percentage of all people below poverty in Sierra County is 2.1 percent higher than in New Mexico. (See Table 3-86.) The percentage of families in Sierra County below poverty is 0.1 percent lower than in the State. In Truth or Consequences, the percent of people in poverty is 8.4 percent higher and the percentage of families is 8.1 percent higher than the percentages in the State. The median household income in the State of New Mexico is $20,228 higher than in Truth or Consequences, or almost twice as high. The median household income in Sierra County is $16,507 less than in the State, or 39.2 percent lower. Sierra County, including Truth or Consequences, therefore qualifies as an environmental justice population on this basis.

Table 3-86. Summary of Economic Characteristics

Location	Percentage of All People Below the Poverty Level	Percentage of Families Below the Poverty Level	Median Household Income*	Median Family Income
Hillsboro CDP	0.0	0.0	$24,875*	$24,875
Truth or Consequences	28.8	23.8	$21,862*	$27,567
Sierra County	22.5	15.6	$25,583*	$38,641
New Mexico	20.4	15.7	$42,090*	$51,020

Source: U.S. Census Bureau 2006-2010.

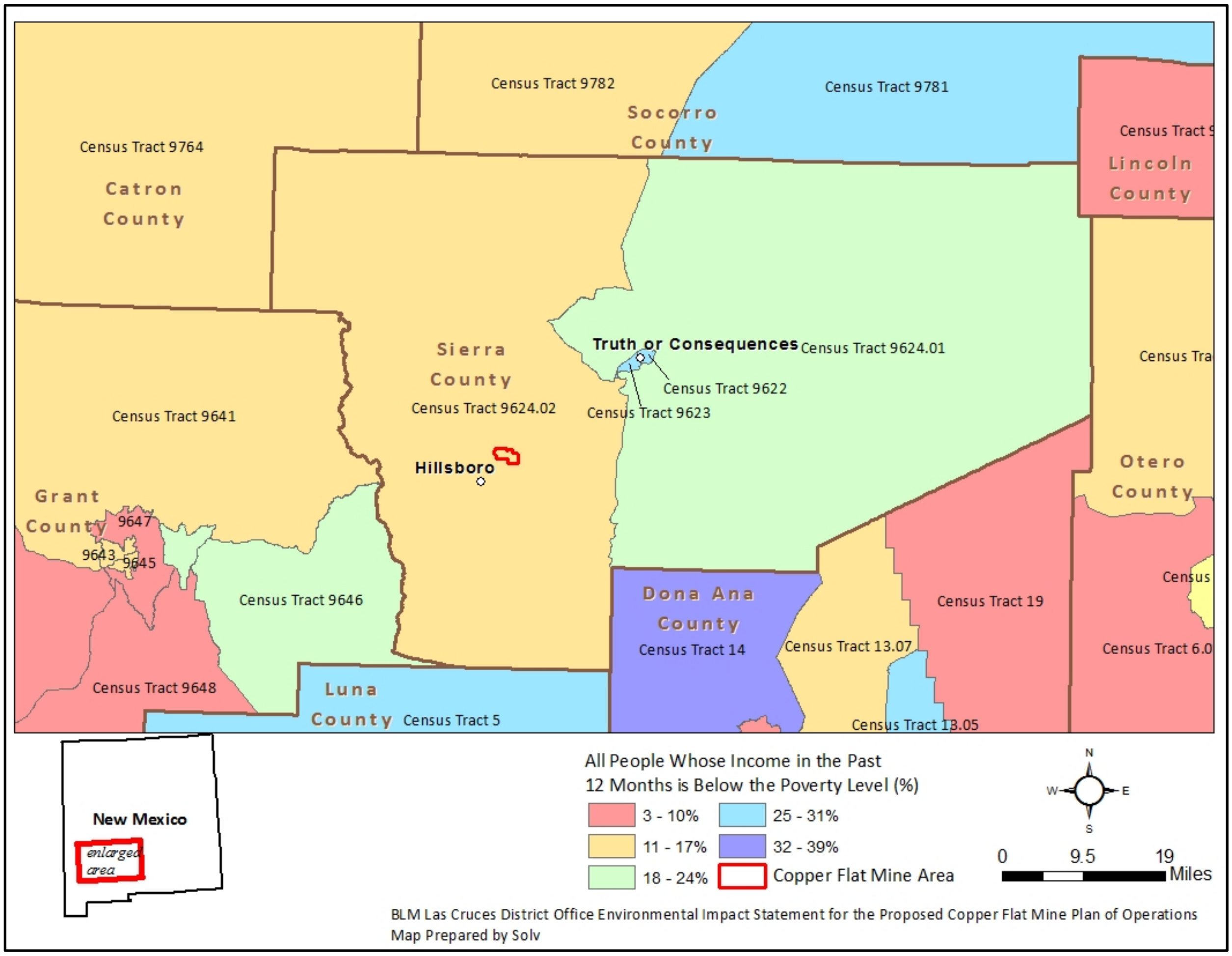
Note: *In 2010 inflation-adjusted dollars.

Pursuant to CEQ's guidance and due to the site-specific nature of the proposed mine, census tract data is used to identify high concentration "pockets" of low-income populations and describe the distribution of low-income populations in the vicinity of the proposed mine (CEQ 1998). It should be noted that although Figure 3-50 and Table 3-87 present census data for a geographic area within the ROI, the ROI does not change and is still defined as Sierra County. Since the proposed mine is located in census tract 9624.02, poverty in census tract 9624.02 is compared to poverty in the nine surrounding census tracts when considering the distribution of low-income populations. The distribution of low-income populations is shown below. (See Figure 3-50.)

In census tract 9624.02, low-income populations represent 21.9 percent of the total population. The percentage of low-income populations in the immediate vicinity does not exceed 50 percent of the population; therefore, it does not constitute an environmental justice population on this basis.

To determine the percentage of low-income populations in the nine surrounding census tracts, the aggregate estimate of all persons living below poverty is divided by the total population for the nine census tracts. In the nine census tracts directly surrounding census tract 9624.02, low-income populations represent 24.7 percent of the population. The percentage of people living below poverty in census tract 9624.02 is lower than the nine surrounding census tracts. As such, census tract 9624.02 does not constitute an environmental justice population on this basis.

Figure 3-50. Percent of Population Below Poverty Level by Census Tract



Source: BLM 2011; ESRI 2010; Census 2010.

Table 3-87. Population Below Poverty Level by Census Tract

Census Tract (CT)	Total Population	Below Poverty Estimate	Below Poverty Percent
9624.02*	2,589	318	12.3
Aggregate of surrounding CTs	30,607	7,571	24.7
9623	3,460	886	25.6
9622	3,456	978	28.3
9624.01	2,483	544	21.9
14	5,719	2,208	38.6
5	4,338	1,280	29.5
9646	3,060	581	19.0
9641	2,515	274	10.9
9764	3,725	570	15.3
9782	1,851	250	13.5

Source: U.S. Census Bureau 2006-2010.

Note: *Proposed mine located in census tract 9624.02.

3.23.2 Environmental Effects

3.23.2.1 Proposed Action

Consideration of the potential consequences of the Proposed Action for environmental justice requires three main components:

1. A demographic assessment of the affected community to identify the presence of minority or low-income populations that may be potentially affected.
2. An assessment of all potential impacts identified to determine if any result in significant adverse impact to the affected environment.
3. An integrated assessment to determine whether any disproportionately high and adverse impacts exist for minority or low-income groups present in the study area.

Where minority or low-income populations are found to represent a high percentage of the total affected population, the potential for these populations to be displaced, suffer a loss of employment or income, or otherwise experience adverse effects to general mental and physical health and well-being is assessed for posing an environmental justice concern.

3.23.2.1.1 Mine Development/Operation

Minority Populations: Sierra County does not constitute an environmental justice population since the percentage of minorities neither exceeds 50 percent nor is substantially higher than the percentage of minorities in the State. Disproportionate impacts to minorities in Sierra County are therefore negligible and not discussed further.

Low-Income Populations: As previously established, Sierra County, including Truth or Consequences, constitutes an environmental justice population due to high poverty levels coupled with low median household income levels. (See Table 3-86, Table 3-87, and Figure 3-50).

In general, the types of potential impacts from the proposed mine would determine the level of potential impacts to low-income populations, and could include:

- Impacts to mine workers through economic pathways, including from “boom and bust”;
- Health risks from increased fugitive dust and exhaust emissions and decreased drinking water quality;
- Safety risks to area recreationists associated with mining operations;
- Restricted or delayed access to institutional places of worship due to traffic and time delays; and
- Restricted or delayed access to hospital or healthcare facilities due to traffic or time delays, or as a result of increased service demand from workforce migration.

Employment Opportunities: The Proposed Action would produce over 2,700 direct jobs during the life of the project (24 years), which would be filled by the local labor force to the extent possible. NMCC is working with the local community to identify the skills needed for operations to allow interested individuals to prepare for or enhance their relevant skills (THEMAC 2011). Beneficial impacts would be felt most by those in search of a job, but the proposed mine would also create a number of indirect or induced jobs from project-related spending and the spending decisions of workers (see Section 3.22, Socioeconomics, for a detailed discussion of jobs and economic activity).

Potential health impacts associated with increased employment overall could disproportionately benefit low-income individuals hired by NMCC. Jobs and income are strongly associated with a number of beneficial health outcomes such as an increase in life expectancy, improved child health status, improved mental health, and reduced rates of chronic and acute disease morbidity and mortality (HDA 2004; Cox et al. 2004).

However, boom periods can also bring about negative health impacts including increases in alcohol and drug use, domestic violence, and unintentional injuries. These types of health impacts have commonly been experienced in other resource extraction communities across North America, and have also been observed in New Mexico during previous mining boom periods (Goldenberg et al. 2010; Seydlitz and Laska 1994; Bush and Medd 2005; Milkman et al. 1980; Brodeur 2003).

Impacts to Air Quality: As described in Section 3.2, Air Quality, during development, operation, and reclamation of the mine, fugitive dust emissions associated with surface disturbance (drilling, blasting, site development, and other earth-moving activities) would be generated. Fugitive dust and exhaust emissions would occur due to heavy vehicles and equipment traveling over paved and unpaved (gravel) surfaces during the mine's lifetime. The majority of the NO_x, SO_2, and CO emissions would be associated with the vehicle/equipment exhaust. Most of the particulate matter emissions would result from surface disturbances associated with the haul trucks and other vehicle and equipment travel over paved and unpaved surfaces. Since these emissions would occur at ground level and would likely cause temporary increases in air pollutant emissions in the immediate vicinity of the proposed mine, it is unlikely that these emissions would be transported more than a few miles, except on windy days and during extreme wind events. BMPs such as road watering would reduce the amount of emissions.

As noted in Section 3.2, Air Quality, the magnitude of adverse impacts on air quality from the Proposed Action during the main phases would range from minor to moderate, but the extent would be limited to mine workers - at least some of whom would be low-income. It is unknown at this time what proportion of mine workers hired by NMCC would be low-income, and therefore it is difficult to categorize the magnitude of potential impacts to low-income mine workers due to air quality. However, based on the skills required for workers at copper mines, it is likely that a disproportionate impact to low-income workers would occur. The overall impact on air quality would not be significant. The USEPA Region 9 and the NMED regulate air quality in New Mexico. The Proposed Action would not exceed major source thresholds outlined in the PSD regulations, generate emissions that would exceed the NAAQS (40 CFR Part 50) at any nearby location, or contribute to a violation of any State, Federal or local air regulation. Each state has the authority to adopt standards stricter than those established under the Federal program; however, New Mexico accepts the Federal standards. Thus, potential impacts to nearby low-income communities related to air pollution would be adverse but not significant.

Impacts to Water Quality: Contamination of groundwater and surface water could result in adverse health effects to low-income populations if drinking water quality is affected.

As discussed in Section 3.4, Water Quality, adverse impacts to water quality are anticipated to be generally minor, short-term, small extent, unlikely, and adverse. The exception to these general findings is that adverse effects to groundwater quality in close proximity to the pit would be major, long-term, small extent, and probable; resulting in an overall finding of significant impact. While the groundwater quality next to the pit lake does not meet State standards, this is only relevant to human health or public safety if groundwater at the pit lake is used as a source of drinking water, which is not the case. Public access to the pit lake affected by an inflow of mining-influenced groundwater would be restricted.

Non-point source pollution could be caused by stormwater interacting with disturbed areas of the mine such as haul roads, parking areas, equipment storage areas or other ancillary facilities. The required multi-sector general permit for stormwater discharges associated with industrial activity will require preparation of a SWPPP; additional recommendations include the installation and use of BMPs for prevention of non-point source pollution from mine facilities and the routine inspection, maintenance, and recordkeeping for all stormwater pollution control facilities. Various laws applying to storage and use of petroleum products, explosives, and potentially hazardous substances at mine sites include a SCP, a SPCC Plan, and additional requirements set forth by MSHA.

There are no drinking water sources near the mine, and no impacts to community water supplies from the use of the freshwater production wells have been identified in the surface and groundwater analyses.

Impacts to Recreation: As discussed in Section 3.16, Recreation, recreational activities that may occur within the area include driving along the area's scenic byways, OHV use, hunting, hiking, and other nature-based activities that may occur on public land such as birdwatching and biking. Visitors frequent Elephant Butte Lake State Park, parts of the Gila and Cibola National Forests, the Black Range Mountains, Turtleback Mountain, and the banks of the Rio Grande.

Fencing and exclusionary devices such as gates would be used to exclude the public from areas of the mine that could present unnecessary hazards. Access to the mine area would be controlled during mining operations to protect the public from possible injury.

Impacts to Transportation and Traffic: Access to and from the site would occur via 3 miles of all-weather gravel road and 10 miles of paved highway (NM-152) east to I-25. Minor impacts would occur to the local transportation network due to a net increase of vehicles on NM-152, which would occasionally reduce standard vehicle speeds.

Sierra Vista Hospital is a rural, community-owned and community-operated 25-bed critical access hospital located in Truth or Consequences, about 18.8 miles northeast from the proposed mine. Payments via Medicaid, State-financed insurance, Medicare, private insurance, and military insurance are accepted. Payment assistance is offered by way of sliding fee scale and case by case basis (SVH 2014). While some time delays and traffic are anticipated, access would not be restricted in the case of a serious accident. However, Sierra County is listed as a health professional shortage area, or as having limited capacity to handle healthcare emergencies or increases in service demand (HRSA 2014). Impacts to community services, including hospitals, are discussed further in Section 3.22, Socioeconomics.

Approximately 40 percent of the population is affiliated with an institutionalized religion in Sierra County (Admaveg, Inc. 2014). There are nine institutional places of worship located within 20 miles of the proposed mine area (ESRI 2014). The closest, Union Community Church, is located 4.1 miles southwest of the proposed mine. The Proposed Action is expected to cause minor and medium-term impacts to traffic and produce some time delays in accessing these institutional places of worship, specifically in close proximity to the mine area. However, since the majority of institutional places of worship are located in Truth or Consequences, impacts to religious activities at the nine aforementioned places of worship are expected to be minimal.

3.23.2.1.2 Mine Closure/Reclamation

Employment Opportunities: As discussed in 3.22, Socioeconomics, the 3-year reclamation phase would support 162 direct jobs. Unlike the development and operation phases, due to the nonspecialized workers needed for reclamation, the majority of jobs could be filled by the local labor force.

The social and economic benefits of job creation discussed under Section 3.23.2.1.1 would not be permanent; they would largely be reversed in the long term after the mine closes and well-paying mining jobs cease to exist. The impact of mining on local economies around the world has often been described as "boom and bust." Moreover, the boom and bust cycle can more heavily impact environmental justice populations. Low-income populations have potential vulnerabilities and a tendency to live paycheck-to-paycheck. The newly-earned income tends not to be saved and cash is spent immediately on food and other commodities. Once environmental justice communities and populations become dependent on the mining boom economy, it is often difficult to maintain the same standard of living and quality of life after the boom ends.

Impacts to Air Quality: Reclamation and revegetation would stabilize exposed soil and control fugitive dust emissions. Once mining ceases and vegetation is re-established, particulate emission levels would return to what is typical for a dry, desert environment. Equipment use, vehicular traffic, and associated emissions would essentially cease following mine closure. Once reclamation is complete, ambient pollutant concentrations would return to existing (i.e., pre-mining operation) levels.

Impacts to Water Quality: There are no drinking water sources near the mine, and no impacts to community water supplies from the use of the freshwater production wells have been identified in the surface and groundwater analyses. It is unlikely that new impacts to low-income populations as they relate to water quality would occur during mine closure/reclamation if they did not occur during mine development/operation.

Impacts to Recreation: Reclamation at the open pit would include construction of fences or other barricades to limit public access to the area.

Impacts to Transportation and Traffic: Vehicular traffic would essentially cease following mine closure.

In summary, medium- and long-term minor adverse effects would be expected to low-income populations under the Proposed Action. Medium-term, localized effects would be limited to the operational phase with the increase of safety risks to recreationists, but safety mechanisms mandated by the MSHA would tightly regulate public access to the mine area. Other medium-term (limited) effects would be probable with low-income miners in close proximity to fugitive dust and heavy vehicle emissions. There are no drinking water sources near the mine, and no impacts to community water supplies have been identified in the surface and groundwater analyses. Long-term effects would be probable due to economic impacts associated with the boom and bust of mining projects. The proposed mining activities would not require lane closures and therefore would not restrict access to hospitals and public health facilities or institutional places of worship, but could increase traffic and cause time delays.

As such, disproportionately high and adverse effects to low-income populations are anticipated. Overall impact to low-income populations would be significant, of minor intensity, medium (localized) extent, medium- to long-term, and probable.

3.23.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The effects from mine development, operation, closure, and reclamation would be similar in nature and level as under the Proposed Action.

3.23.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The effects from mine development, operation, closure, and reclamation would be similar in nature and level as Alternative 1 and the Proposed Action.

3.23.2.4 No Action Alternative

Assuming that the Proposed Action is not implemented, no change would occur to the existing population in the ROI. Since ongoing activities would be substantially the same as those already occurring, no significant additional change in community character and setting would be anticipated. Existing conditions would remain substantially unchanged and have no effect on low-income populations.

3.23.3 Mitigation Measures

Mitigation activities could enhance the positive effects and minimize negative effects from "boom and bust" mining activity on low-income populations, historically more prone to the effects of "boom and bust." Note that the effect of any environmental justice mitigation would be difficult to measure. Potential mitigation could include:

- Provide job training programs aimed at developing the skills of the local population to enable employment in the mining industry. While NMCC anticipates hiring over 70 percent of the workforce from local communities, the portion of labor hired locally will be dependent on the skill levels of the local labor force at the time of hiring for the construction phase and the applicability of these skills moving into the operations phase. Such job training program(s) would increase the percentage of local residents filling jobs created by the mine by enabling the local community to identify skills anticipated for operations and allow interested individuals to enhance their skill set.
- Provide benefits package to employees that encourages saving and installation of 401K programs in an effort to reduce the severity of effects to environmental justice populations from boom and bust (TEEIC 2013a). While the effectiveness of financial education and literacy programs is difficult to measure, most studies find some positive correlation between financial education and financial well-being (Walstad et al. 2010). Financial education has been shown to reduce debt, home foreclosures, bankruptcies (especially medical bankruptcies), and unemployment (Long 2011). The provision of health care and 401K programs could reduce the severity of effects from the "bust."
- BMPs minimizing impacts to air or water quality would also minimize impacts to low-income populations.

3.24 HUMAN HEALTH AND PUBLIC SAFETY

3.24.1 Affected Environment

Mining and related activities may pose risks to human health and public safety (HHPS) without protective measures that minimize these risks. This section will describe the human health and public safety setting elements within which potential effects may occur or are managed to avoid effects. The topics covered in this resource section include:

- Mine safety training;
- Pollution: chemicals and metals;
- Worker injuries and fatalities;
- Employment and health;
- Location-specific risks; and
- The regulatory environment.

3.24.1.1 Mine Safety Training

Due to the high number of injuries and mortalities caused by special circumstances surrounding mining at the time, the Federal Mine Safety and Health Act of 1977 created the Mine Safety and Health Administration (MSHA), which oversees the safety of mine workers (MSHA No date[a]). Any mine worker may file a complaint with MSHA if a safety concern is not resolved with a supervisor (Bokich 2012).

In 30 CFR 48, MSHA requires safety training for all miners, which includes at least 8 hours of refresher training every year and at least 24 hours of training for new miners. A surface metal mine must have a training plan approved by the MSHA District Manager of the area in which the mine is located. The training plan lists the teaching methods and course materials. Required safety topics for the annual refresher course for surface metal miners are:

- Instruction and demonstration of use, care, and maintenance of applicable self-rescue and respiratory devices;
- Instruction on the transportation controls, such as controls for transportation of miners and materials, and communication systems, such as use of mine communication systems, warning signals, and directional signs;
- Review of escape system, escape and emergency evacuation plans in effect at the mine, and instruction in the fire warning signals and firefighting procedures;
- When applicable, introduction to and instruction on the mine's highwall and ground control plans, procedures for working safely in areas of highwalls, water hazards, pits, and spoil banks, and safe work procedures during hours of darkness;
- Instruction on the purpose of taking dust measurements (if applicable), noise, and other health measurements, any health control plan in effect at the mine shall be explained, and explanation of the health provisions of the Federal Mine Safety and Health Act and warning labels;
- Recognition and avoidance of electrical hazards;
- Instruction in first aid methods acceptable to MSHA;
- With mines storing or using explosives, review and instruction on explosive related hazards;

- Health and safety aspects of the tasks to which the miner will be assigned; and
- Review of accidents and causes of accidents as well as instruction in accident prevention in work environment.

New miners receive training in the same topics covered in the refresher courses, excluding the review of accidents, as well as training on the following subjects:

- Instruction in the statutory rights of miners and their representatives under the Federal Mine Safety and Health Act and authority and responsibility of the supervisors, which includes procedures for reporting hazards;
- Tour of mine or representative portion of the mine with observation and explanation of method of mining or operation; and
- Recognition and avoidance of present mine hazards.

Additional training subjects for both new and experienced miners may be required by the MSHA District Manager based on the mine's conditions and circumstances. Miners also receive safety training prior to new work for which they have not demonstrated safe operating procedures within the previous 12 months and either received training or performed the task within the previous 12 months. All training must be performed by MSHA-approved instructors, except for new task training of miners and hazard training. A representative for the miners must receive a copy of the training plan or a copy of the training plan must be posted 2 weeks prior to submission to the MSHA District Manager. Any miner comments would be submitted to MSHA with the training plan, or miners can submit directly to MSHA's District Manager concerns regarding the training plan (30 CFR 48).

At least once annually, all surface delivery, office, or scientific worker, students, or occasional, short-term maintenance or service worker would receive hazard training. In addition to any training deemed necessary by the MSHA District Manager, this training includes the following subjects (30 CFR 48):

- Hazard recognition and avoidance;
- Emergency and evacuation procedures;
- Health and safety standards, safety rules, and safe working procedures; and
- Self-rescue and respiratory devices.

3.24.1.2 Pollution

Mining involves activities that could potentially introduce pollution into the environment without protective measures. Workers and the public could be exposed to this contamination, which could cause a wide range of health issues depending on the contaminant type, concentration, and exposure length, as well as individual characteristics, such as age.

Without protective measures, HHPS can be negatively impacted by unmanaged air pollution. Section 3.2, Air Quality, discusses in greater detail the setting for air resources affected by the Proposed Action. Air pollution can cause breathing problems; throat and eye irritation; cancer; birth defects; and damage to immune, neurological, reproductive, and respiratory systems (USEPA 2012a). Some types of air pollution can lead to global warming (See Section 3.3, Climate Change and Sustainability). Potential human health and safety impacts can be caused by global climate change effects associated with rising sea level, increased rate of respiratory disease, and increased exposure to extreme heat (Miller 2003). National and State ambient air quality standards provide for the maximum allowable atmospheric concentrations of pollutants that may occur while protecting public health and welfare with a reasonable margin of safety.

Chemical and other material spills from construction and mine operations, typically associated with improper waste management, are also sources of possible impacts to HHPS. Spills can introduce soil and water contamination and create exposure pathways to workers and the public. The severity of risks and effects from a spill are determined by its composition and quantity. For example, a common material used in construction and mine operations that could be spilled at the proposed mine area is diesel, which is an irritant of the lungs and skin. High levels of diesel exposure can cause nervous system damage or death (ATSDR 2011). Section 3.9, Hazardous Materials and Solid Waste/Waste Disposal, discusses in greater detail the affected environment for wastes and materials present from the implementation of the Proposed Action or the alternatives.

3.24.1.3 Chemicals and Metals

Without protective measures, HHPS could be negatively impacted by uncontrolled exposure to metals and chemicals used in mining. In their undisturbed State, the metals stored in rock are mostly stable within the environment. During mining, there is some potential that these metals may be reintroduced into water, soil, and air, potentially exposing humans and other animals (such as livestock). Unmanaged exposure to these metals could cause adverse health effects. Mining processes by their nature concentrate these extracted metals, potentially exposing individuals to higher concentrations and increasing associated health risks without proper management. The mining process also uses various chemicals that could pose additional health and safety risks, such as those that cause explosions or contain toxic materials. The severity of risks depend on type of the metal or chemical involved and its quantity, method of exposure (ingestion, inhalation, etc.), and other chemicals in the surroundings that could react producing fumes, fires, and other hazards.

Copper is a naturally occurring metal that, in low quantities, is essential for health. However, toxic health effects occur at high levels of copper exposure. Copper released to the soil from weathering of rocks or discharge from human activities generally bonds to soil's topic layers. Similarly, copper released into water forms copper compounds or binds to suspended particles in water. Exposure to high levels of copper can irritate the nose, mouth, and eyes. Long-term exposure to particulates containing copper can cause headaches, dizziness, nausea, and diarrhea. The consumption of large amounts of copper in drinking water can also cause nausea, stomach cramps, and diarrhea. Animals that consume sufficient quantities of copper exhibit decreased fetal growth (ATSDR 2004).

Though inadequate human and animals studies prevent the USEPA from determining if copper is a carcinogen (ATSDR 2004), the agency has set a not-to-exceed limit of 1.3 mg of copper per liter in drinking water due to the other negative health effects of copper exposure and consumption (USEPA 2012b). During an 8-hour work shift and 40-hour workweek, the Occupational Safety and Health Administration (OSHA)'s copper exposure limit is 0.1 mg per cubic meter (mg/m^3) for copper fumes (vapors from heating copper) and 1.0 mg/m^3 for copper dusts and mists (ATSDR 2004).

Molybdenum is another metal that would be mined during this project. It can cause irritation of the eyes, nose, and throat as well as liver and kidney damage (NIOSH 2011). Molybdenum creates fires when in contact with some chemicals, including strong acids used in mining, and must be stored at an appropriate distance from these chemicals. Finely dispersed particles of molybdenum can cause explosions. To prevent explosions and to avoid the health issues found in studies of animals exposed to molybdenum, dust suppression and breathing protection is critical. The National Institute for Occupational Safety and Health (NIOSH) has determined that further study is required to determine the health and environmental effects of molybdenum. Molybdenum's threshold limit value is 10 mg/m^3 for the inhalable fraction and 3 mg/m^3 for the respirable fraction based on an 8-hour workday in a 40-hour workweek due to adverse health effects seen in animal studies (NIOSH 2006).

Silver is another metal proposed for mining at the Copper Flat site. Silver is naturally released from rocks during weathering. Long-term human exposure to high levels of silver causes arygria, or blue-gray discoloration of body tissues including skin. Respiration of high levels of silver can cause stomach pains, breathing problems, and lung and throat irritation. The Agency for Toxic Substances and Disease Registry (ATSDR) has determined that the reproductive and developmental impacts of silver are unknown due to lack of studies. Similarly, according to USEPA, the human carcinogenicity of silver is not classifiable, mainly due to lack of studies (ATSDR 1999). However, due to suspected health impacts, the USEPA has set a not-to-exceed amount of 0.1 mg per liter of silver in drinking water (USEPA 2012c). Any releases or spills of greater than or equal to 1,000 pounds of silver must be reported to USEPA. The OSHA 8-hour workday, 40-hour workweek exposure limit to silver is 0.01 mg/m^3 (ATSDR 1999).

Gold would also be mined at Copper Flat. However, gold presents no health and safety risks that require implementation of protective measures beyond the use of standard dust and safety equipment. Some compounds of gold require additional safety measures (Williams Advanced Materials No date).

As listed in Section 3.9, Hazardous Materials and Solid Waste/Waste Disposal, other chemicals would be used in the proposed project. By volume, the major compounds that would be utilized are lime, ammonium sulfide, and sodium hydrosulfide. Other chemicals would be used at an order of magnitude less (over million pounds a year versus around a hundred thousand pounds or less a year). Further discussion of chemicals is included in Section 3.9.

Lime or calcium hydroxide can cause sore throat and coughing if inhaled, burning of the eyes, and abdominal pains and cramps if swallowed. Lime violently reacts with acids to form heat and possibly fire, which poses additional safety hazards in industrial scenarios such as mining, where many different chemicals are used. OSHA has set the time-weighted average permissible exposure limit for lime for 8-hours at 15 mg/m^3 for total dust and 5 mg/m^3 for respirable fraction (NIOSH 1997).

Ammonium sulfide is corrosive and is a fire hazard. It causes irritation, headache, dizziness, and passing out. Symptoms begin at exposure to around 500 ppm. When mixed with water, ammonium sulfide creates the toxic, flammable hydrogen sulfide (NJDHSS 2011). OSHA has not set any exposure limits for this substance (NOAA 1999).

Sodium hydrosulfide is corrosive, toxic with contact to skin, and causes severe eye damage. Inhalation of sodium hydrosulfide causes sore throat and burning sensations. Skin and eye exposure can cause redness, pain, and burns. Ingestion can cause burns, abdominal pain, vomiting, and shock. Sodium hydrosulfide creates dangerous hydrogen sulfide when mixed with moisture. OSHA has not set exposure limits to this substance, but it is considered a poison (NIOSH 2008).

3.24.1.4 Work Injuries and Fatalities

Both construction and mining work will occur during the development phases of the mining project. Both of these types of occupations may be hazardous due to the tasks involved, especially the use of heavy machinery. The construction industry had the most fatal work injuries of any industry in 2013. The 2013 fatal work injury rate per 100,000 full-time equivalent workers is 9.4 for construction workers compared to 3.2 for all workers (BLS 2014).

Fatal injuries in private mines, quarrying, and oil and gas extraction sites decreased 15 percent in 2013 from 2012 (BLS 2014). Of the 154 fatalities in 2013 for mining, quarrying, and oil and gas extraction, the mining industry alone accounted for 39 of the fatalities within this group, which is less than 1 percent of the 4,405 fatalities reported for all industries. The 2013 all-injury rate of 2.11 per 200,000 hours worked for metal/non-metal mines was a 30 percent decrease since 2007 (MSHA 2014a). The 2013 fatality rate of .0103 per 200,000 hours worked for metal/non-metal mines was a 30 percent decrease since 2007 (MSHA 2014b).

3.24.1.5 Employment and Health

An issue raised in the public scoping period for this project was the effect of employment on health. A comment was made that there was a lack of local opportunities for youth with and without college educations. Copper Flat would provide training and jobs for those with little or no experience and provide MSHA training and certification. This subsection addresses the relationship of employment status on mental and physical health of workers and their families.

Employment and income have a strong influence on a person's health. A review of 46 original studies and 23 additional articles on the effect of unemployment on health showed a strong, positive association between unemployment and several poor health outcomes, such as physical or mental illness (Jin et al. 1995). Thirty-three different studies covering over 150,000 participants from 24 different countries also showed that employment is related to health (Hartman No date). This relationship is found in men and women as well as younger and older individuals (Hartman No date). Causality is complicated by confounding factors such as financial hardships (Jin et al. 1995; Bartley 1994).

Employment offers more than financial security; it provides structure, mental and physical activity, and opportunities for social interaction. One study concluded that a reduced psychological and physical State can occur even when unemployment benefits meant no change to income. However, other studies have shown that after 12 to 18 months, the deterioration of health effects from continuous unemployment plateau, which may be due to adaptive responses like lowered personal expectations (Bartley 1994). Further, unfulfilling jobs can be as detrimental to psychological health as unemployment (Bartley 1994; Brousseau and Yen 2000). Spouses and families also receive the benefits of employment and consequences of unemployment (Jin et al. 1995; Brousseau and Yen 2000). One study found unemployment stress to be equal to or exceeding that of a divorce (Jin et al. 1995).

3.24.1.6 Location-specific Risks

In addition to the typical risks associated with mining, the proposed project, with its rural New Mexico location, introduces additional risk factors to human health and safety. This subsection discusses the location-specific risks.

Risks from working outdoors in rural New Mexico include bites or other dangerous exposure to snakes, disease-carrying rodents, and other wildlife such as scorpions and spiders, as well as sun and heat exposure. Twisted ankles or other injuries from use of uneven or unstable ground can also occur. Risks common to use of heavy machinery include injury from entanglement of clothing and other items, such as jewelry. Workers in the project area can fall and injure themselves or others. Risks are also posed by objects falling from areas such as the walls of the mine, tailings storage facilities, and in other storage and work areas. Working in a remote setting such as Copper Flat mine also complicates injury or safety incidents as emergency medical staff and facilities are relatively far away.

Large equipment would also be moving into, out of, and around the facility. As with most mining projects, large equipment carrying hazardous materials presents many safety concerns, particularly when related to traffic accidents (see Section 3.20, Transportation and Traffic). Radioactive exposure from rocks commonly found in copper mining areas is another potential safety issue. This is discussed in Sections 3.4, Water Quality, and 3.7, Mineral and Geologic Resources.

3.24.1.7 Regulatory Environment

Several laws and regulations that protect worker and public safety would apply to this project. This section will briefly note some of the most relevant examples. MSHA directly regulates mining practices that promote HHPS. Federal agencies such as the USEPA and agencies within the State of New Mexico regulate the quality of the environment, which in turn protects HHPS. Further descriptions of these regulations are in the sections for each applicable resource area, such as air or water.

The Clean Water Act and Federal Water Pollution Control Act Amendments regulate discharge to surface waters from point sources (BLM 2012). Pursuant to the Clean Water Act, the USEPA reviews the adequacy of NEPA documents (USFS and MDEQ 2011). The New Mexico Water Quality Act, New Mexico Statutes Annotated 1978 §74-6-1 et seq., protects groundwater from pollution and reduces groundwater pollution from mines (BLM 2012).

RCRA regulates hazardous waste storage, treatment, and disposal (BLM 2012a). By the Emergency Planning and Community Right-to-Know Act of 1986 (42 USC 11001–11050), the private sector must inventory chemicals and chemical products, report those in excess of threshold planning quantities, inventory emergency response equipment, provide annual reports and support to local and State emergency response organizations, and maintain a liaison with the local and State emergency response organizations and the public. The Pollution Prevention Act of 1990 (42 USC 13101–13109) encourages and requires prevention and reduction of waste streams and other pollution through minimization, process change, and recycling. It encourages and requires development of new technology and markets to meet the objectives (USFS 2011).

30 CFR 62 Section 100 sets forth health standards for mines subject to the Federal Mine Safety and Health Act of 1977. Also, 30 CFR 56 provides specific safety and health standards to surface metal and nonmetal mine operations (USFS 2011). New Mexico Statute 69-27-1 requires that mine employers must provide a reasonably safe working environment and utilize all safety procedures and equipment for the workers' protection. Similarly, by New Mexico Statues 69-27-6, all workers must not lessen the safety of others by failing to obey orders or degrade or remove the equipment (New Mexico Compilation Commission No date).

3.24.2 Environmental Effects

3.24.2.1 Proposed Action

Minor short-term and medium-term small extent and unlikely adverse effects would be expected under the Proposed Action. Short-term effects may be characterized by such pollutants as fugitive dust and heavy vehicle emissions during site preparation, while medium-term effects would be due to fugitive dust and heavy vehicle emissions during mine operation and reclamation. Effects would be of a small extent, typically confined to the site or facilities within the site. The likelihood of occurrence would be under conditions of a malfunction or upset of routine working conditions.

Without protective measures, the mining activities described in Chapter 2 have the potential to pose a risk to HHPS, including blasting, using heavy machinery and chemicals, and risks presented by outdoor activities. There are three important baseline requirements that serve as the foundation for managing HHPS at the mine area. The mine employer provides MSHA-compliant training for mine workers according to an approved plan that raises the level of awareness for all workers and supervisory personnel at the mine area. Second, the mine is inspected at least twice annually by MSHA to help ensure the mine's compliance with established MSHA regulations from development through reclamation. Third, fencing and exclusionary devices such as gates are used to exclude the public, in particular, from areas of the mine that could present unnecessary hazards. Mine workers are trained to recognize and manage hazards, but the public has no training and so is excluded from areas that would pose hazards to untrained individuals.

3.24.2.1.1 Mine Development and Operation

Effects of air pollution are determined by Section 3.2, Air Quality, to be short- and medium-term minor adverse effects. Short-term effects would be due to fugitive dust and heavy vehicle emissions during site preparation, while medium-term effects would be due to fugitive dust and heavy vehicle emissions during mine operation.

Effects of water quality are anticipated to be generally minor, short-term, small extent, unlikely, and adverse (Section 3.4, Water Quality). The exception to these general findings is that groundwater quality effects in close proximity to the pit are determined to be major, long-term, small extent, probable and adverse, resulting in an overall significant effect finding. This is because the quality of the existing groundwater next to the pit does not meet State standards set for groundwater quality. Water quality as measured by these standards is only relevant to HHPS if the water were used as a drinking water source, which is unlikely. Public access to the pit lake affected by an inflow of mining-influenced groundwater would be restricted and there are no operational or reclamation purposes served by worker contact with this water. The small extent of the lower quality groundwater near the pit indicates that there would be no HHPS issues associated with water supply withdrawal for uses that could lead to human exposure. Therefore the HHPS effects from water quality are most accurately described as minor, short-term, small extent, unlikely, and adverse.

Effects of contamination resulting from waste disposal or handling of hazardous materials are determined by Section 3.9, Hazardous Materials and Solid Waste/Waste Disposal, to be short-term minor adverse effects under the Proposed Action. The use and management of hazardous materials required for operation of the Copper Flat project are intended to be in accordance with safe handling and disposal procedures established by applicable laws and regulations. The short-term minor adverse environmental effects would be limited to an accidental release during standard facility operations. No long-term adverse effects would be anticipated due to the required response actions that would be taken in the event of an accidental release.

Exposure of humans to extracted metals and chemicals that are classified as hazardous materials and are used in the mining process could produce short-term minor adverse effects under the Proposed Action. (See Section 3.9 Hazardous Materials and Solid Waste/Solid Waste Disposal.) In addition, the mandatory mine safety training for workers and suitable access to Materials Safety Data Sheets (MSDSs) raises the awareness of workers to these exposures and trains them in the proper handling, storage, and exposure reduction practices associated with these substances. Regular inspections by MSHA provide an independent regulatory assurance that exposures of this type are minimized or eliminated at the mine area.

The effects from work injuries and fatalities are determined to be of minor magnitude, short-term duration, small extent, possible likelihood, and adverse. Mining activities are potentially hazardous, so they are regulated by MSHA, inspected regularly for compliance with established health and safety requirements, and subject to mandatory health and safety training for workers to increase awareness and compliant work behaviors. Despite these provisions, work injuries and fatalities in mine construction and mine operation rarely occur, as noted in Section 3.24.1. The applicable consideration that addresses the rare occurrences of major worker injuries or fatalities is whether they are reasonably foreseeable. With the implementation of the above-mentioned programmatic safeguards, it is most reasonable to conclude that worker injuries would be minor in magnitude for expected construction and mine operation activities. NEPA analyses are no longer required to evaluate or base decisions upon worst-case scenarios, which in this case would be major injuries or fatalities that arise despite the implementation of commonplace and mandated safeguards.

Based upon the information on employment status and health presented in Section 3.24.1, effects from this factor for the Proposed Action are determined to be of minor magnitude, long-term duration, medium extent, probable likelihood, and beneficial. This combination of effects results in an impact rating for this element of HHPS of moderately significant, but since the effect is beneficial, no mitigation to reduce the significance of the effect is warranted.

Project-specific risks that arise from performing mining work outdoors in rural New Mexico are determined to be of minor magnitude, short-term duration, small extent, possible likelihood, and adverse with examples involving biting animals, uneven terrain, use of explosives, the movement of large vehicles, operation of crushing and grinding equipment, and high work platforms. These project-specific risks associated with mining or outdoor work are addressed in the mandatory mine worker safety training. Along with important standard mine safety information, which is also project-specific for surface mining issues, the training creates awareness of local topics such as snake-bit avoidance and treatment, other local wildlife that may be hazardous, hazards that may arise from inclement weather, and health and safety responses that may be necessary due to the rural remote location of the mine.

Laws and regulations noted in Section 3.24.1 require construction companies and mine operators to perform activities in a manner that protects mine workers and the public. In the absence of these laws and regulations, it is possible that these same activities would present greater hazards, perhaps similar to hazardous conditions that were present at mines before laws were enacted and regulations were put in place. Therefore, mine activities that are compliant with current laws and regulations are minor in magnitude, long-term in duration, of medium extent, of probable likelihood, and beneficial. This combination of effects results in an impact rating for this element of HHPS of moderately significant. Since the effect is beneficial, no mitigation to reduce the significance of the effect is warranted.

3.24.2.1.1 Mine Closure/Reclamation

Under conditions of mine closure and reclamation, the character of work performed at the site would be different from that of mine development and operation. Generally, many of the same hazards remain, although somewhat diminished in the scope of potential harm to HHPS with the shutdown of ore processing activities. This phase of the project in many ways resembles the construction phase of the project where facilities would be demolished and the focus would be on shaping and restoring disturbed land such that future degradation is minimized. Fewer personnel would be present and fewer movements of heavy equipment are likely in that hauling of extracted ore, waste rock, and processed ore would have ceased. This would be balanced to an extent by the movement of heavy equipment involved with demolition and recontouring slopes that are being reclaimed.

The effects of potential pollution would be diminished from the mine development and operation stage by the decrease in the level of activity, but would be minor in magnitude, short term in duration, small extent, and adverse. The potential for air pollution remains due to fugitive dust and heavy equipment emissions, such that Clean Air Act compliance responses described in Section 3.2 would remain in effect. Water quality effects described in Section 3.4 would remain as described. Pollution from waste disposal or handling of hazardous materials would be diminished as the potential resulting from use of chemicals in ore processing has ceased, even though substances such as diesel fuel would remain on-site.

Effects resulting from exposures to extracted metals and chemicals should be substantially reduced but not eliminated for this stage of the project, because metals are no longer being extracted and chemicals used in processing are no longer being used. Minimal adverse effects will occur of minor magnitude, short-term duration, and small extent. As removal of ore processing equipment occurs, protection from metals exposure resulting from residual concentrations associated with the equipment would be necessary as provided in safety training and standard operating procedures.

The effects from worker injuries and fatalities during the mine closure and reclamation stage would continue to be of minor magnitude, short-term duration, small extent, possible likelihood, and adverse, as the effects and the environment is similar to that of mine development and operation. There are fewer concerns with injuries and fatalities associated with ore extraction and processing, but there continues to be a need for safeguards related to use of heavy equipment and demolition activities.

Because of the shorter duration of the mine closure and reclamation period, expected effects due to employment status and health are of minor magnitude, medium-term duration, medium extent, probable likelihood and beneficial. As was the case with this element of mine development and operation, this combination of effects results in an impact rating for this element of HHPS of moderately significant. However, since the effect is beneficial, no mitigation to reduce the significance of the effect is warranted.

Project-specific risks would be the same as for mine development and operations, except that risks for use of explosives and operation of crushing and grinding equipment would be eliminated. The effects of these risks are determined to be minor magnitude, short-term duration, small extent, possible likelihood, and adverse.

Actions taken in the mine closure and reclamation stage that are compliant with current laws and regulations are minor in magnitude, long-term in duration, of medium extent, of probable likelihood, and beneficial. As was the case with regulatory response for the mine development and operation stage, this combination of effects results in an impact rating for this element of HHPS of moderately significant, but since the effect is beneficial, no mitigation to reduce the significance of the effect is warranted.

3.24.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

The overall effects of this alternative, as well as the individual effects resulting from the implementation of Alternative 1, are the same as the Proposed Action. The primary differences between Alternative 1 and the Proposed Action that affect HHPS are as follows:

- Process rate increased to nominal 25,000 tpd;
- Mine life shortened to 11 years due to higher process rate;
- Total disturbance footprint reduced;
- Number and disturbance footprint of rock storage piles reduced;
- Power requirements increase due to increased process rate; and
- Concentrate loads trucked increase due to higher process rate.

The increased ore production rate will result in more mine personnel employed on a daily basis, more trucks and heavy equipment utilized on a daily basis, and a shorter mine life. This means that more chemicals would be used, more pollution would be generated, more personnel would be exposed to heavy equipment operation, and the pool of potentially injured workers would be greater for any given day of mine development, mine operation, mine closure, or mine reclamation. The worker training and regulatory applicability remains at a constant level of protection, however, irrespective of these other increased levels. The shorter mine life means that the total number of days of health and safety exposure over the life of the mine would be reduced by 30 percent. Higher numbers of personnel employed over a shorter mine life tend to balance each other out in the effects of employment. The duration of this effect for mine development and operation is of medium duration rather than long-term, however the overall of employment remains moderately significant and beneficial.

3.24.2.3 Alternative 2: Accelerated Operations – 30,000 Tons per Day

The overall effect of this alternative and the individual effects resulting from the implementation of Alternative 2 are the same as the Proposed Action. The primary differences between Alternative 2 and the Proposed Action in terms of how they would affect HHPS are as follows:

- Process rate increased to nominal 30,000 tpd;
- Total tons processed increased 25 million tons over life of mine
- Mine life shortened to 11 years due to higher process rate;
- Total disturbance footprint reduced;
- Number and disturbance footprint of rock storage piles reduced;
- Power requirements increase due to increased process rate; and
- Concentrate loads trucked increase due to higher process rate.

The increased ore production rate would have the same individual effects as described for Alternative 1, except that Alternative 2 would also process 25 million more tons over the life of the mine. This increased production would have no additional effect on the overall or individual effects that were described for Alternative 1.

3.24.2.4 No Action Alternative

The No Action Alternative would avoid potential impacts of the Proposed Action to HHPS.

3.24.3 Mitigation Measures

No specific mitigation measures for HHPS have been identified for any alternative. The implementation of a health and safety training program and actions that are compliant with laws and regulations intended to protect HHPS represent a mitigation measure for mining actions that would otherwise be hazardous, but these safeguards are included with the Proposed Action and two alternative actions with no option for removal.

3.25 UTILITIES AND INFRASTRUCTURE

3.25.1 Affected Environment

Utilities that serve the surrounding communities of Hillsboro and Truth or Consequences include power, water, wastewater, and solid waste removal. The communities and households that are served by these utilities are described in Section 3.22, Socioeconomics.

3.25.1.1 Power

Power to the area is supplied by Tri-State Generation and Transmission Association and distributed by the Sierra Electric Cooperative. A 115-kilovolt (kV) power line was installed for the mine in 1982 because of the limited capacity of other existing power lines in the areas that supplied the community of Hillsboro and surrounding rural areas (M3 2012). This power line, which comes from a substation 13 miles to the east at Caballo Reservoir, is currently not in service (THEMAC 2013). The mine's substation, used in 1982, has since been removed and would need to be reconstructed for the project (M3 2012). In addition to the Tri-State transmission lines, a 345-kV power line owned by El Paso Electric (another regional electric utility) crosses the inactive 115-kV line approximately 7 miles east of the mine.

An existing 25-kV distribution line that originally provided power to the production water wells located east of the mine, booster stations on the fresh water pipeline, and the reclaim water pump stations at the tailings dam are no longer serviceable for these purposes and would need to be replaced (M3 2012).

3.25.1.2 Water Supply Network

Four high-capacity production water wells are located about 8 miles east of the plant site on BLM-administered public land. These wells were drilled to depths of between 957 feet and 1,005 feet. All are 26 inches in diameter and cased with 16-inch casing. Most of the original roads and electrical supply that serve the production wells, as well as pump foundations, are intact. An existing 20-inch welded steel pipeline transports water to the project site. The pipeline is buried a minimum of 2 feet deep from the well field to the point of entry into the mine area (THEMAC 2011). Inspections of the pipeline conducted in 2011 indicated that it was in serviceable condition pending refurbishment work and repairs (THEMAC 2012). Water supplies for the communities surrounding the project site are provided by local utilities and water districts, including the city of Truth or Consequences and the Hillsboro Mutual Domestic Water Consumers Association (BLM 1999).

3.25.1.3 Sewage Treatment System

Wastewater in the communities surrounding the project site is managed through public utilities and private septic systems.

3.25.1.3 Solid Waste Disposal

The Sierra County Landfill north of Truth or Consequences closed at the end of 2010; however, it is still used as a solid waste transfer station where county residents drop off residential refuse for transport to a landfill (Sierra County 2014). Transfer stations also exist at Arrey and Hillsboro. Solid waste in the project area is currently managed at the Truth or Consequences Waste Collection and Recycling Center.

3.25.1.4 Mine Facilities and Buildings

Most mine and mill area buildings from the Quintana mine were removed in 1986, but concrete foundations remain and were backfilled to preserve them for future use. A State and Federally approved water diversion channel also still exists, which redirects offsite drainage flows around the mine area.

Additional structures and facilities still present on site from the Quintana operation include the primary crusher structure, the reclaim tunnel, concentrator building foundation, truck shop, administration building slab, and the access cut from the millsite to the tailings area (THEMAC 2012).

3.25.1.5 Mine Haul and Access Roads

Transportation and access to the mine is addressed in Section 3.20, Transportation and Traffic. Most original haul and access roads are intact. These roads are unpaved. Existing haul and access roads occupy approximately 23 acres on public and private lands (THEMAC 2011). A number of pre-1981, primitive roads also currently exist within the proposed mine area.

3.25.2 Environmental Effects

3.25.2.1 Proposed Action

The Proposed Action is not expected to result in the addition of a significant number of households to the surrounding community. This is discussed further in Section 3.22, Socioeconomics. Therefore, an increase in demand for utility services in the communities surrounding the project site as a result of the Proposed Action is not anticipated. The only increase in demand for utility services anticipated would be those created by the mining operation itself.

3.25.2.1.1 Mine Development/Operation

Power: Since the 115kV power line that would be reconnected under the Proposed Action does not currently serve any other users, no effects are anticipated by the use of this line. Under the Proposed Action, electrical demand is estimated at 22.4 kWh/ton. At the proposed rate of 17,500 tpd, this would result in a daily electrical demand of 391.8 megawatt hours (MWh). Tri-State Generation has stated that sufficient power generating capacity exists to meet mine needs without impacting other users (Capps 2014). The El Paso Electric line may be connected to the 115kV line; this would be the most favorable method of bringing power to the site. The on-site substation would be reconstructed in the same location as in 1982 and would be fenced and constructed in accordance with BLM stipulations.

The power demands of the mine are not anticipated to approach the capacity of power suppliers under any operating condition. Any impacts to the power supply system would be anticipated to be minor, short term, small, unlikely, and therefore not significant based on the significance criteria established for the project.

Water Supply System: The total water demand for the project would be approximately 8,283 gpm with the majority of the water used in the ore processing operation. Of this demand, approximately 5,928 gpm, or 72 percent, would be obtained from reclaimed process water, pit water pumping (dewatering), and other recycling and water conservation measures described in the Proposed Action (Section 2.1.7).

Approximately 2,356 gpm, or 28 percent, would be freshwater make-up (THEMAC 2014). Freshwater would be conveyed from the production wells in an existing 20-inch welded steel pipeline. A pipeline of this size and material type may be expected to carry up to 6,500 gpm (MS 2012). Average annual water use would be approximately 3,802 AF, with a total life of mine water use of approximately 261,000 AF.

Freshwater would be supplied by the existing production wells and would not place a draw on domestic water sources. There are no drinking water sources near the mine (Section 3.4), and no impacts to community water supplies from the use of the freshwater production wells have been identified in the surface and groundwater analyses (Sections 3.5 and 3.6). The extent to which drawdowns from pumping may impair existing private wells would be finally determined by the New Mexico OSE.

Sewage Treatment: Sanitary liquid wastes would be handled and disposed of through two existing septic tanks/leach fields permitted by NMED. The septic systems would be slightly modified, including enlargement of the leach fields and placement of larger septic tanks. The washing facility for the mobile equipment would be equipped with a water/oil separator system. At closure the septic tanks and leach fields would be decommissioned.

An estimated daily workforce of 250 persons (Section 2.1.5) using an estimated allowance of 50 gallons per person per day for sanitary purposes (THEMAC 2013a) would result in approximately 12,500 gallons of liquid waste per day entering the septic system.

As no demand is anticipated to be placed on domestic or municipal sewage systems in the region, impacts to these systems are expected to be minor, short term, small, unlikely, and therefore not significant based on the significance criteria established for the project.

Solid Waste Disposal: Non-hazardous solid waste generated by the mine would be disposed of in the permitted on-site Class III sanitary landfill on private land, placing no demand on the waste stream in the surrounding areas. At closure, the landfill would be closed according to NMED requirements (THEMAC 2011). Hazardous waste is addressed in Section 3.9; however, very low amounts of hazardous waste are expected to be generated, and would be removed by a licensed operator for proper disposal at an off-site permitted landfill.

As no demand is anticipated to be placed on county or municipal waste streams, impacts to these systems are expected to be minor, short term, of small extent, unlikely, and therefore not significant based on the significance criteria established for the project.

Mine Facilities and Buildings: Mine facilities would be constructed at the site of the original Quintana plant site and, to the extent practicable, would use the original concrete foundations, thereby minimizing disturbances to new areas. Re-using or upgrading existing infrastructure would limit impacts to additional areas not affected by the original mining operation. Where practicable and economically feasible, NMCC would consider alternative construction materials and techniques to improve the overall energy efficiency of the project. This may include renewable energy generation (solar, wind, etc.) for certain buildings (THEMAC 2011).

On-site facilities and buildings would be constructed to meet the demands of the mine, would be limited to the mine area, and would remain throughout the life of the mine and part of the reclamation period. Therefore, impacts are expected to be minor, short term, small, unlikely, and therefore not significant based on significance criteria established for the project.

Roads: Existing haul and access roads would be utilized to the extent possible. Under the Proposed Action, haul and access road coverage would be increased by 35 acres, for a total of 58 acres. Haul roads are not expected to create new areas of disturbance, as they would be constructed on previously disturbed land (THEMAC 2011). Exploration roads and pads would be sited as much as possible to avoid any identified cultural resources (THEMAC 2011).

A fugitive dust control program would provide for water application on haul roads and other disturbed areas; chemical dust suppressant application (such as magnesium chloride) may be used where appropriate (THEMAC 2011). Fugitive dust is addressed in detail in Section 3.2, Air Quality.

Roads on the project site would be constructed to meet the demands of the mine, be limited to the mine area, and remain throughout the life of the mine and part of the reclamation period. Therefore, impacts are expected to be minor, short term, small, unlikely, and therefore not significant based on significance criteria established for the project.

3.25.2.1.2 Mine Closure/Reclamation

At closure, all facilities, equipment, and buildings would be removed and areas would be reclaimed according to applicable standards and revegetation plans (THEMAC 2011). Production wells would be abandoned in accordance with applicable rules and regulations (THEMAC 2011).

3.25.2.2 Alternative 1: Accelerated Operations – 25,000 Tons per Day

As under the Proposed Action, the action proposed under Alternative 1 is not expected to result in the addition of a significant number of households to the surrounding community (Section 3.2.2). Therefore, an increase in demand for utility services in the surrounding community as a result of Alternative 1 is not anticipated. The only increase in demand for utility services anticipated would be those created by the mining operation itself.

Power: Since the 115kV power line that would be reconnected under Alternative 1 does not currently serve any other users, no effects are anticipated by the use of this line. Under Alternative 1, electrical demand is estimated at 22.37 kWh/ton. At the proposed rate of 25,000 tpd, this would result in a daily demand of 5559.25MWh. Tri-State Generation has stated that sufficient power generating capacity exists to meet mine needs without impacting other users (Capps 2014). The El Paso Electric line may be connected to the 115-kV line; this would be the most favorable method of bringing power to the site. As in the Proposed Action, the substation would be reconstructed in the same on-site location as in 1982 and would be fenced and constructed in accordance with BLM stipulations. By connecting the 115-kV line to the El Paso transmission line, any potential issues with the capacity of the system feeding the 115-kV line at the Caballo station would be eliminated.

As the power demands of the mine are not anticipated to approach the capacity of power suppliers under any operating condition, any impacts to the power supply system would be anticipated to be minor, short term, small, unlikely, and therefore not significant based on the significance criteria established for the project. This is similar to impacts anticipated under the Proposed Action.

Water Supply System: The total water demand for the project under Alternative 1 would be approximately 11,569 gpm with the majority of the water used in the ore processing operation. Of this demand, approximately 8,292 gpm, or 72 percent, would be obtained from reclaimed process water, pit water pumping (dewatering), and other recycling and water conservation measures described in Alternative 1. Approximately 3,277 gpm, or 28 percent, would be freshwater make-up (Section 2.2.7). As under the Proposed Action, freshwater would be conveyed from the production wells in an existing 20-inch welded steel pipeline. A pipeline of this size and material type may be expected to carry up to 6,500 gpm (M3 2013a). Average annual water use would be approximately 5,290 AF, with a total life of mine water use of approximately 255,000 AF.

Freshwater would be supplied by the existing wells and would not place a draw on domestic water sources (THEMAC 2011). There are no drinking water sources near the mine (Section 3.4), and no impacts to community water supplies from the use of the freshwater production wells have been identified in the surface and groundwater analyses (Sections 3.5 and 3.6). At closure, the BLM would decide if production wells and pipelines would be left in place (THEMAC 2012a).

Similar to the Proposed Action, the extent to which drawdowns from pumping may impair existing private wells would be finally determined by the New Mexico OSE.

Sewage Treatment: All sanitary liquid waste under Alternative 1 would be treated by a septic system. This will place no demand on the capacities for sewage treatment in the surrounding communities. An estimated daily workforce of 265 people (Section 2.2.5) using an estimated allowance of 50 gallons per person per day for sanitary purposes (THEMAC 2013a) would results in approximately 13,250 gallons of liquid waste per day entering the package plant. Fifty gallons per person per day is considered a conservative estimate.

Similar to the Proposed Action, no demand is anticipated to be placed on domestic or municipal sewage systems in the region; therefore, impacts to these systems are expected to be minor, short term, small, unlikely, and therefore not significant based on the significance criteria established for the project.

Solid Waste Disposal: Similar to the Proposed Action, solid waste disposal would be the same under Alternative 1 as under the Proposed Action; impacts to these systems are expected to be minor, short term, of small extent, unlikely, and therefore not significant based on significance criteria established for the project.

Mine Facilities and Buildings: As under the Proposed Action, mine facilities and buildings under Alternative 1 would utilize the original plant site and minimize impacts to new areas. Renewable energy generation and alternative building materials would be considered where practicable. Impacts are expected to be minor, short term, small, unlikely, and therefore not significant based on the significance criteria established for the project.

Roads: Existing haul roads under Alternative 1 would be utilized to the extent possible with some minor realignment. Under Alternative 1, haul road coverage on the project site would be approximately 25 acres, 33 acres less than the Proposed Action. A fugitive dust control program would utilize water, and chemical dust suppressant application (such as magnesium chloride) may be used where appropriate (THEMAC 2012a). Fugitive dust is addressed in detail in Section 3.2, Air Quality.

Roads within the project site would be constructed to meet the demands of the mine, would be limited to the mine area, and would remain throughout the life of the mine and part of the reclamation period. Therefore, impacts are expected to be minor, short term, small, unlikely, and therefore not significant based on the significance criteria established for the project.

3.25.2.3 Alternative 2: Accelerated Operations– 30,000 Tons per Day

Similar to the Proposed Action, the action proposed under Alternative 2 is not expected to result in the addition of a significant number of households to the surrounding community (Section 3.2.2). Therefore, an increase in demand for utility services in the surrounding community as a result of Alternative 2 is not anticipated. The only increase in demand for utility services anticipated would be those created by the mining operation itself.

Power: Under Alternative 2, electrical demand is estimated at 22.36-kWh/ton. At the proposed rate of 30,000 tpd, this would result in a daily demand of 670.8 MWh. Tri-State Generation has stated that sufficient power generating capacity exists to meet mine needs without impacting other users (Capps 2014). The El Paso Electric line would be connected to the 115-kV line; this would be the most favorable method of bringing power to the site. A new substation is planned as a 345-kV, three-breaker ring bus substation, expandable to a future breaker-and-a-half configuration, with a 345/115-kV, 100MVA transformer bank and single breaker on the 115-kV low-side. This new primary substation would be located on State Trust land south of NM-152 and east of the production wells. The on-site substation would be reconstructed in the same location as in 1982 and would be fenced and constructed in accordance with BLM stipulations.

The power demands of the mine are not anticipated to approach the capacity of power suppliers under any operating condition. As such, any impacts to the power supply system would be anticipated to be minor, short term, small, unlikely, and therefore not significant based on the significance criteria established for the project. This is similar to impacts anticipated under the Proposed Action.

Water Supply System: The total water demand for the project under Alternative 2 would be approximately 13,761 gpm with the majority of the water used in the ore processing operation. Of this demand, approximately 9,978 gpm, or 73 percent, would be obtained from reclaimed process water, pit water pumping (dewatering), and other recycling and water conservation measures described in Alternative 2. Approximately 3,782 gpm, or 27 percent, would be freshwater make-up (Section 2.3.7). As under the Proposed Action, freshwater would be conveyed from the production wells in an existing 20-inch welded steel pipeline. A pipeline of this size and material type may be expected to carry up to 16,500 gpm (M3 2013a). Average annual water use would be approximately 6,105 AF, with a total life of mine water use of approximately 253,000 AF. The water pipeline would be removed following mine closure.

Freshwater would be supplied by the existing wells and would not place a draw on domestic water sources (THEMAC 2011). There are no drinking water sources near the mine (Section 3.4), and no impacts to community water supplies from the use of the freshwater production wells have been identified in the surface and groundwater analyses (Sections 3.5 and 3.6).

Similar to the Proposed Action, the extent to which drawdowns from pumping may impair existing private wells would be definitively determined by the New Mexico OSE.

Sewage Treatment: All sanitary liquid waste would be treated by the planned package water treatment plant and recycled back into the process water stream, placing no demand on the capacities for sewage treatment in the surrounding communities. An estimated daily workforce of 270 people per day using an estimated allowance of 50 gallons per person per day for sanitary purposes (THEMAC 2013a) would result in approximately 13,500 gallons of liquid waste per day entering the package plant (THEMAC 2013). Fifty gallons per person per day is considered a conservative estimate.

Similar to the Proposed Action, no demand is anticipated to be placed on domestic or municipal sewage systems in the region; therefore, impacts to these systems are expected to be minor, short term, small, unlikely, and therefore not significant based on the significance criteria established for the project.

Solid Waste Disposal: Solid waste disposal would be the same under Alternative 2 as for the Proposed Action and Alternative 1; impacts to these systems are expected to minor, short term, of small extent, unlikely, and therefore not significant based on the significance criteria established for the project.

Mine Facilities and Buildings: Construction and operation associated with mine facilities and buildings would be the same under Alternative 2 as for the Proposed Action, utilizing the original plant site and minimizing impacts to new areas. Renewable energy generation and alternative building materials would be considered where practicable (THEMAC 2013). Impacts are expected to be minor, short term, small, unlikely, and therefore would not be significant based on significance criteria established for the project.

Roads: As under the Proposed Action and Alternative 1, existing haul roads would be utilized under Alternative 2 to the extent possible with some minor realignment. Under Alternative 2, haul and access road coverage would be increased by 11 acres, for a total of 34 acres. Exploration roads and pads would be sited as much as possible to avoid any identified cultural resources (THEMAC 2013).

A fugitive dust control program would provide for water application on haul roads and other disturbed areas; chemical dust suppressant application (such as magnesium chloride) may be used where appropriate (THEMAC 2013). Fugitive dust is addressed in detail in Section 3.2.

Roads within the project site would be constructed to meet the demands of the mine, would be limited to the mine area, and would remain throughout the life of the mine and part of the reclamation period. Therefore, impacts are expected to be minor, short term, small, unlikely, and therefore would not be significant based on significance criteria established for the project.

3.25.2.4 No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action or alternatives. No utility or infrastructure upgrades would occur.

3.25.3 Mitigation Measures

Mitigation measures identified in the Proposed Action and Alternatives 1 and 2 include implementing alternative power generation where practical, recycling of gray water and process water to reduce overall water demand from mining operations, implementing fugitive dust control, and the reuse of existing haul and access roads, existing structures, foundations, facilities, and disturbance footprint, to the extent practical.

3.26 PALEONTOLOGY

Paleontological resources, or fossils, include the bodily remains, traces, or imprints of plants and animals preserved in the earth. Paleontological resources also include related geological information, such as rock types and ages. Most fossils occur in sedimentary rock formations. The geological and physical characteristics of paleontological resources in a known fossil location, either on or outside of BLM-managed public land, may often indicate the potential presence of other paleontological resources in similar rock formations and outcrops on BLM-managed public land. Unlike cultural resources, which may exist largely at or near the land surface, paleontological resources are found both at the surface and throughout the subsurface environment. The primary source for information in Section 3.26, unless otherwise noted, is the TriCounty Draft Resource Management Plan/Environmental Impact Statement, April 2013 (BLM 2013).

3.26.1 Affected Environment

Sierra County has many geologic formations. The rocks of the Precambrian era include a complex of gneiss with metasedimentary and metavolcanic rocks intruded by granites that are not fossil bearing. The rock formations of the Early Paleozoic era (limestones, sandstones, shales, and conglomerates) are widespread in southern New Mexico, and include nearly 320 million years of deposition of marine sediments with invertebrate fossils.

In Sierra County, the greatest potential for fossils occurs in the alluvial and terrace deposits (including the Santa Fe Group) along the Rio Grande; in portions of the Caballo, Fra Cristobal, San Andres, and Mimbres mountains; and in the Jornada del Muerto area near Elephant Butte Reservoir. Most of these locations are a considerable distance from the proposed Copper Flat mine. Fossils found in Sierra County are listed below. (See Table 3-88.)

Table 3-88. Fossils Found in Sierra County

Table 3-88. Fossils Found in Sierra County		
Geologic Period	**Formation**	**Fossils**
Quaternary-Tertiary (Neogene)	Otero	Mammals (horse, camel, mammoths), reptiles
Tertiary (Neogene)	Palomas (Santa Fe Group)	Charaphyta, gar fish, crustaceans, mammals (dogs, horses, camels, gomphotheres, coryphodons, leopards), reptiles
Tertiary (Paleogene)	Jordan Canyon	Mammal (merycoidodontidae)
Tertiary (Paleogene)	Rubio Peak Formation	Reptile
Tertiary (Paleogene)	Love Ranch	Brontothere
Tertiary (Paleogene)	Palm Park	Mammals (horses, brontotheres, hyracodotidae, hyaenodontidae), reptiles, plants
Permian	Abo	Arthropods and other insects, amphibians, reptiles, miscellaneous other vertebrates and invertebrates, conifers and other plants
Permian	Bursum	Vertebrates

No paleontological resources of critical or educational value have been identified within the proposed mine area. The western half of the mine area lies predominantly in Cretaceous-age andesite formations, which are not conducive to fossil formation because of their origin in a molten, volcanic environment. The eastern half of the mine area is within the Palomas Formation of the Santa Fe Group.

The Santa Fe Group is Miocene to Pliocene in age, the same age as the Ogallala Formation in eastern New Mexico, which has produced a variety of mammalian fauna. It is designated as a Potential Fossil

Yield Classification (PFYC) 3 area (BLM 2013). The Palomas Formation represents two depositional environments forming interpenetrating wedges: alluvial fan deposits from the surrounding uplifts and axial river deposits from the ancestral Rio Grande. Vertebrate fossil localities have been found in the Palomas Formation in the Palomas Basin area. Almost all of them occur in the axial river deposits (Ziegler 2015).

The mine area also includes some local incisions such as Greyback Arroyo that expose medial and distal alluvial fan deposits of the Palomas Formation. These consist primarily of poorly sorted pebble to cobble gravels or poorly lithified conglomerates with clast composition including basalt, andesite, rhyolite, tuff, chert, and chalcedony (Ziegler 2015).

Some of the fossil material found nearest to Copper Flat includes the Kelly Canyon local fauna (found just north of Caballo), the Caballo local fauna (found along the western shore of Caballo Lake), and the Palomas Creek local fauna (discovered 8 km southwest of Truth or Consequences). The Kelly Canyon local fauna includes fish, frogs, salamanders, snakes, birds, woodrat, and muskrat fossil material. The Caballo local fauna is dominated by much larger animals, including large land tortoises, glyptodonts, horses, camels, cervids, and gomphotheres. The Palomas Creek fauna is similar to the Caballo fauna and fossil material pertaining to rodents, horses, peccary, camels, mastodons, tortoises, and ground sloths have been recovered from this locality (Ziegler 2015). The nearest known significant fossil assemblage to Copper Flat is located at Percha Box (T16S, R7W, Section 14) approximately 2.5 miles south of the Proposed Action area (BLM 1999).

3.26.2 Environmental Effects

This section discusses impacts on paleontological resources that could occur as a result of proposed mining activities. Surface-disturbing activities involving excavation can “discover,” and at the same time inadvertently damage or destroy, sub-surface paleontological resources. When discovery occurs, resources can be curated for scientific, educational, or recreational values. Conversely, with these activities the fossil resource could be damaged, destroyed, or lost. Restriction of public access during mining operations could both reduce the potential for public discovery and diminish the chance of vandalism or theft. Removal of vegetation and soil from the surface may expose fossils. The largest potential impacts on paleontological resources would occur where surface disturbances take place in formations with high potential for paleontological resources.

Activities associated with the Proposed Action that could result in erosion would not necessarily damage paleontological resources; however, excessive erosion resulting from surface disturbance could damage fossils present at the surface.

3.26.2.1 Proposed Action

No paleontological resources of critical or educational value have been identified within the proposed mine area (BLM 1999). Paleontological surveys were performed outside the mine area at millsite staging areas that discovered no additional paleontological resources (Ziegler 2015). The nearest known significant fossil assemblage is located at Percha Box (T16S, R7W, Section 14) approximately 2.5 miles south of the Proposed Action area.

3.26.2.1.1 Mine Development/Operation

Under the Proposed Action, no impacts on paleontological resources are anticipated as a result of implementing actions associated with mine construction or mining operations, such as development related to power, water supply, sewage treatment, solid waste disposal, mine facilities and buildings, or roads.

3.26.2.1.2 Mine Closure/Reclamation

At closure, all facilities, equipment, and buildings would be removed and areas would be reclaimed according to applicable standards and revegetation plans (THEMAC 2011). Production wells would be abandoned in accordance with applicable rules and regulations (THEMAC 2011). Under the Proposed Action, impacts on paleontological resources are not anticipated as a result of implementing these actions associated with mine closure and reclamation.

3.26.2.2 Alternative 1

The environmental effects on paleontological resources under Alternative 1 would be the same as those that would occur under the Proposed Action.

3.26.2.3 Alternative 2

The environmental effects on paleontological resources that would occur under Alternative 2 would be the same as those that would occur under Alternative 1. Paleontological surveys were also performed outside the mine area at the site of a proposed electrical substation (only proposed under Alternative 2) that discovered no additional paleontological resources (Ziegler 2015).

3.26.2.4 No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action or alternatives. No impacts to paleontological resources would occur.

3.26.3 Mitigation Measures

No paleontological resources have been discovered in the mine area and other surveyed areas. Therefore mitigation measures are not necessary. However, environmental protection measures would be implemented as described in Section 2.1.16 in the unlikely event that paleontological resources are discovered as a result of mine development, operations, closure, or reclamation.

3.27 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

In describing the appropriate content of an EIS, NEPA Section 102(C)(iv) requires that an EIS consider "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity". In its declaration of national environmental policy found within NEPA Section 101, Congress establishes the goal of creating and maintaining conditions for productive harmony between man and nature, charging the Federal government with responsibility for using all practicable means and measures to achieve this harmony.

The primary existing productivity of the Copper Flat mine area features vegetation growth suitable for grazing by livestock (cattle) and other ruminants, as well as other general wildlife habitat. Previous mining activity at the site in the 1980s with the reclamation and restoration standards required at that time may have made the site less productive than what was present prior to mining operations. The site is not used for timber growth or harvest, farming, or any aquatic productivity uses as the existing pit lake is not usable and there is little or no other usable water on the site.

The Copper Flat mine area would be mined for copper and other locatable minerals such as gold, silver, and molybdenum. Through proposed contemporaneous reclamation efforts to be performed during mining operations and final activities performed at closure of the mining phase, the project site would be reclaimed and restored in accordance with a reclamation plan required and approved by the BLM and the MMD.

Once reclaimed, the site productivity would return to the same uses of the mine area that occur at present, with the exception that the expansion of the pit lake area leaves slightly less available productive area. These uses would include open range cattle grazing, low-density recreational uses such as hunting, and wildlife habitat. Modern reclamation and restoration requirements, including increased soil cover requirements introduced by the recent adoption of the Copper Rule in New Mexico, would likely result in an overall productivity increase in affected land that could meet or exceed levels of productivity present at the site prior to mining activities performed in the 1980s.

Therefore, development of this site for a mine would not eliminate the potential for long-term productivity of this land. No significant impacts to long-term productivity are expected to occur from the proposed project.

3.28 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An EIS is required by NEPA Section 102(C)(v) to discuss whether implementing the Proposed Action would, for any reason, irreversibly and irretrievably commit resources, making them unavailable for other purposes. An example of this would be a decision to consume a resource, such as fuel, that is then no longer available for other purposes and cannot be recycled or reused. Such a commitment must be described and evaluated with benefits of the project.

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mineral ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Some resources committed for this project involve requisite amounts of steel, iron, concrete, and fuel required to construct a mine to extract mineral ore. Project equipment and construction commuters would use fossil fuels (diesel and gasoline derived from non-renewable oil) during the construction development phase of the mine. Effects from the commitment of construction resources for such a mine (e.g., gravel, cement, iron, etc.) would be expected to be minor and not significant. No significant impact on, or demand for, construction material resources is anticipated.

During operation of the mine, fuel resources would be consumed by trucks hauling ore. Considering the number of trucks per day involved in this transport, no significant impacts to gasoline or diesel fuel resources would occur in the State or the region. Some materials such as steel and concrete may be reclaimed or recycled when the project is completed and the site reclaimed. Fuel used during construction and operation is irretrievable.

Some water used for processing and smaller mining-related uses, although extensively recycled, is not renewable and represents an irreversible use of resources. Recovery in the bedrock near the mine pit would be limited. Recovery in the Sante Fe Group would eventually (over decades) be essentially complete.

Copper and other locatable minerals would be mined and processed into a more concentrated form. Once mined and processed into refined products, these metals are potentially and very often recycled and reused. Therefore, only a small amount of the refined product would be irreversibly and irretrievably lost as a mineral resource.

A small amount of terrestrial wildlife habitat would be lost long term due to the expansion of the pit area. Waterfowl would use the expanded pit lake area, but a small amount of terrestrial habitat at the rim of the current pit area would be excavated with the pit expansion.

The site currently presents itself visually as a former mine in the area within and surrounding the mine area because of previous mine activities from the 1980s. At mine closure and the completion of reclamation and restoration activities, the mine would still be visible, perhaps with a visibly larger mine footprint, although modern reclamation and restoration requirements would minimize the long-term visual impacts.

Therefore, development and operation of this site for a mine would not eliminate the potential for the irreversible and irretrievable commitment of resources for this land.

CHAPTER 4

CUMULATIVE IMPACTS

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CHAPTER 4. CUMULATIVE IMPACTS

The Council on Environmental Quality's (CEQ) Regulations (40 CFR 1500-1508) implementing the procedural provisions of the National Environmental Policy Act (NEPA), as amended (42 USC 4321), define cumulative impacts as:

> *"…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other action (40 CFR 1508.7)"*

Incorporating the principles of cumulative impacts analysis into the environmental impact assessment of an action should address the following:

- Past, present, and reasonably foreseeable future actions;
- All Federal, non-Federal, and private actions;
- Impacts on each affected resource, ecosystem, and human community; and
- Truly meaningful effects.

When describing the affected environment of cumulative impacts, natural boundaries should be used. When determining the environmental consequences of cumulative impacts, additive, opposing, and synergistic effects should be addressed. Also considered should be the sustainability of resources, ecosystems, and human communities. The analysis should look beyond the life of the Proposed Action.

Section 4.1 addresses the past and present actions associated with the proposed project. Section 4.2 then presents reasonably foreseeable future actions. Section 4.3 provides the cumulative environmental consequences for the Proposed Action and the alternatives.

4.1 PAST AND PRESENT ACTIONS

Past and present actions considered in this chapter are summarized at the end of Chapter 4. (See Table 4-1.) Within Sierra County, there are numerous land use organizations and agencies that manage parcels within the county, including:

- **The Bureau of Land Management (BLM):** The BLM manages 822,000 acres in Sierra County, nearly 45 percent of its land base. The land use plan for the BLM is called a Resource Management Plan (RMP). The last update to the RMP, the White Sands RMP, is dated 1986 and is currently in revision with a new Tri-County RMP.
- **The Bureau of Reclamation (BOR):** The BOR manages an estimated 70,000 acres in Sierra County, about 4 percent of the County's land base. Its mission is the development of water resources primarily for agriculture and flood control. Although recreation was a peripheral benefit during much of the BOR's history, in recent years, the growth of recreation has become a major management activity in many BOR project areas. The BOR has primary responsibility for water storage and delivery for irrigation and municipal use along the Rio Grande in New Mexico. Currently, the BOR manages two water control projects in the Sierra County portion of the Rio Grande. It monitors arroyos and maintains channels feeding into the river. The BOR also leases land surrounding the reservoirs to State Parks for four State parks in the area. The BOR works with the Sierra Soil and Water Conservation District to remove invasive species like salt cedar. It also works with National Resource Conservation Service on stream banks for fish enhancement.
- **Elephant Butte State Park:** Located on BOR land, Elephant Butte State Park holds the largest and most visited lake in the State of New Mexico. Elephant Butte Dam was

completed in 1916 and was the largest dam in the world at the time. It was listed on the National Register of Historic Places in 1979. At full capacity, the lake is 31,000 surface acres of water plus another 30,000 land acres. It has seven campgrounds, nine comfort stations, a day use area, four boat ramps, five boat docks, and four trails.

4.2 REASONABLY FORESEEABLE FUTURE ACTIONS

The actions described in this section were identified by information taken from the personal communication with the BLM and other Federal agency staff and personal communication with commercial and local representatives of the Chambers of Commerce and local economic development entities in the area. (See Table 4-1.) There are some actions that could be considered speculative, such as stating that more development would occur in an area because existing recreational facilities would entice additional facilities to accommodate expansion. These are actions that would not meet the criteria which potential future actions must meet to be considered reasonably foreseeable, such as 1) legislation drafted to implement the action; 2) the existence of a completed approved plan; 3) an awarded contract for work on action; or 4) any work on an action that is currently being prepared.

The timeframe for the analysis includes activities or actions that are reasonably foreseeable for the duration of the project. That would include construction, mine operations, closure, and reclamation. For the purposes of this discussion, the mine operation would be 16 years. The duration is assumed to occur approximately between the years 2016 and 2040. Construction activities would start at the beginning of this timeframe.

4.2.1 Highway Development

- **Tri-County RMP Decisions for the Lake Country Backcountry Byway:** This Byway is nestled between the Mimbres and Caballo Mountains and the Cooke's Range in southwestern New Mexico over NM-152 and 27 between Las Cruces and Truth or Consequences, near a string of lakes and reservoirs. Resource management decisions are forthcoming for the three counties affected by the Byway.
- **Union Pacific Intermodal Transfer Station:** A $400 million Union Pacific rail facility is proposed in Santa Teresa, New Mexico. The locomotive fueling station and intermodal freight yard are expected to create 3,000 jobs during 4 years of construction and to bring 600 permanent jobs once the facility is operating at full capacity in 2025. The facility, to occupy 2,200 acres, will include fueling facilities, crew change buildings, and an intermodal yard and ramp to load and unload up to 250,000 containers annually that are designed for seamless transfer among ships, trucks, and trains.

4.2.2 Natural Resource Extraction

- **Mine Plan of Operations Amendment for Freeport McMoran at Cobre Mine:** Future mining operations are proposed at Cobre's Continental Pit and Hanover Mountain Mine, which involve hauling copper ore to Chino's existing facility. Cobre is proposing to construct the connecting haul road to transport the Cobre ore to the Chino operations facility for processing. The total mine production rate for the Continental Pit and Hanover Mountain Mine at Cobre will range from about 20,000 to 125,000 tons per day (tpd). The mining-related activities will commence immediately upon BLM approval and occur over a 10-year period.

4.2.3 Urban Development

- **SunZia Transmission Line:** SunZia Transmission, LLC plans to construct and operate two 500 kilovolt (kV) transmission lines originating at a new substation in Lincoln County in the vicinity of Corona, New Mexico, and terminating at the Pinal Central Substation in Pinal County near Coolidge, Arizona. The proposed transmission line would cross just to the east of the mine.

4.2.4 Rural Development

- **Continued Grazing Permit Authorization:** Ongoing permits for grazing on BLM-administered land in New Mexico.

4.2.5 Commercial Development

- **Spaceport America:** Spaceport America is the first purpose-built commercial spaceport in the world. It is located a short distance from Truth or Consequences in southern Sierra County. Virgin Galactic is the spaceport's anchor tenant. Spaceport America has been providing commercial launch services since 2006. Phase One construction is now complete. Phase Two of the construction and pre-operations activities has begun and includes improvements to the vertical launch complex, the paving of the southern road to the spaceport, and the development of a world-class visitor center for students, tourists, and space launch customers.

Table 4-1. Past, Present, and Reasonably Foreseeable Future Actions

Table 4-1. Past, Present, and Reasonably Foreseeable Future Actions	
Project/Action	**Description of the Action**
Past Actions (Settlement to 1950)	
Community Settlement	Truth or Consequences, originally known as Hot Springs, grew up around the construction of Elephant Butte Dam in 1912, although the area had long been inhabited by Apache and Spanish settlers.
Livestock Grazing And Rangeland Improvements	Ranching and livestock grazing has been a predominant use of the land since the 1880s, when railroads arrived in the territory. Historically, grazing on public land has been authorized and numerous rangeland improvements such as fencing and watering sources have been developed.
Taylor Grazing Act Of 1934	The Taylor Grazing Act of 1934 (Title 43 United States Code Section 315), signed by President Roosevelt, was intended to "*stop injury to the public grazing lands by preventing overgrazing and soil deterioration; to provide for their orderly use, improvement, and development; to stabilize the livestock industry dependent upon the public range*." The BLM is now required to allot grazing permits to ranchers and monitor and enforce grazing allowances. Additionally, a portion of the fees collected for grazing livestock on public land was returned to the appropriate grazing district to be used for range improvements.
Water Development, Elephant Butte And Caballo Reservoir	The Territorial Legislature of New Mexico passed a law providing for the creation of a water users' association that met the Federal requirements to establish these associations on United States reclamation projects. A convention was held on May 21, 1906, between the U.S. and Mexico determining that 60,000 acre-feet of water would be sent annually to Juárez, Mexico, from the reservoir at Elephant Butte.

Table 4-1. Past, Present, and Reasonably Foreseeable Future Actions (Continued)	
Project/Action	**Description of the Action**
Rio Grande Canalization Project	The Rio Grande Canalization Project was constructed between 1938 and 1943 in southern New Mexico, continuing east to Texas. The project provides protection against a 100-year flood and assures releases of waters to Mexico in accordance with the 1906 convention. It extends 106 miles along the Rio Grande from the Percha Division Dam below Caballo Dam in New Mexico southward into Texas below El Paso.
Climatic Events	Severe droughts occurred in 1916-18, 1921-26, 1934, 1951-57, and 2007-2012. The 1951-57 drought and the latest drought are believed to have been the most severe in the past 350 years. Floods occurred on the Rio Grande in 1904, 1905, 1929, 1935, and 1941 (NOAA 2012).
Military Bases: Fort Bliss; Holloman Air Force Base, White Sand Proving Grounds, New Mexico	Established in 1848, Fort Bliss is located on 1.12 million acres of land extending across Texas and New Mexico. With the U.S. entry into World War I, Fort Bliss was garrisoned by a Provisional Cavalry division. Holloman Air Force Base was established in 1942 as Alamogordo Air Field, 6 miles west of Alamogordo. Located east of Las Cruces and later renamed White Sands Missile Range, the White Sands Proving Grounds was established in 1945. The 3,200-square-mile range is where the first atomic bomb was tested in 1945.
Present Actions (1950 to 2014)	
Copper Flat Mine	Copper mining has been pursued in the Copper Flat area northwest of Hillsboro since the mid-1950s. Exploration continued into the 1970s when sufficient reserves were identified. In 1982, an open pit copper mine was developed and operated for just 3 months.
Current Ranching Activities	Ranching continues to take place on public land within the Planning Area. The Federal Rangeland Improvement Act of 1978 improved grazing allotment management for the BLM. Most of the public land in the Planning Area is grazed by livestock. Livestock production has declined in recent years due to the low market value and the current drought. Currently in New Mexico livestock grazing on public land is guided by the *New Mexico Standards for Public Land Health and Guidelines for Livestock Grazing Management* (BLM 2000a).
Wilderness Act Of 1964	Congress passed the Wilderness Act of 1964, which directed the Secretary of Agriculture to establish guidelines for wilderness.
Restoration Along The Rio Grande To Improve Riparian Habitat, Water Quality, And Water Quantity	Restoration improvements along the Rio Grande include reducing the consumptive water use of floodplain vegetation by improving riparian habitat. Current activities include removing salt cedar and planting native vegetation that will enhance riparian habitat and require less water. Other current and ongoing restoration activities include grade control and sediment capture structures, relocating diversions, and reconnecting channels and floodplains.
Desalination Plants	A new water desalination plant was constructed on Fort Bliss, east of El Paso International Airport. The facility has been part of the water-supply system for the City of El Paso. Two other plants are in development in Alamogordo: the Tularosa Basin National Desalination Research Facility and the Alamogordo Municipal Desalination Plant. The Alamogordo Municipal Desalination Plant would process water from a well field on public land about 10 miles north of Tularosa.
Nonnative Phreatophyte/ Watershed Management Plan	The *Nonnative Phreatophyte/Watershed Management Plan* focuses on the prevention and control of tamarisk and associated nonnative invasive plants with the ultimate goal of restoring healthy, productive ecosystems. The plan will facilitate management and implementation of future control practices and rehabilitation efforts in New Mexico’s watersheds and riparian areas.

Table 4-1. Past, Present, and Reasonably Foreseeable Future Actions (Continued)	
Project/Action	**Description of the Action**
New Mexico Environmental Department Watershed Restoration Action Strategy	The Watershed Restoration Action Strategy grant for the Lower Rio Grande watershed, enabled under the Clean Water Act, Section 319(h), provides an opportunity for the New Mexico Department of Agriculture to list specific water quality problems in the Lower Rio Grande, and it identifies the contaminants that are causing these problems and their sources. Strategies have been developed to improve watershed conditions through best management practices.
New Mexico Game And Fish Comprehensive Wildlife Conservation Strategy	The New Mexico Comprehensive Wildlife Conservation Strategy identifies species and habitats of greatest conservation concern in the State. Its focus is on Species of Greatest Conservation Need (SGCN), key wildlife habitats, and the conservation of both. The desire is that New Mexico's key habitats persist in the condition, connectivity, and quantity to sustain viable populations of SGCN.
Water-Supply Projects	*Elephant Butte Irrigation District:* In 1979, the Elephant Butte Irrigation District assumed control over the operation and maintenance of ditches and canals within its district. However, the Bureau of Reclamation remained in charge of the reservoir, dam, and diversion dams.
Reasonably Foreseeable Future Actions (2015 to 2045)	
Projected Population Growth	The populations of Sierra, Otero, and Doña Ana counties are anticipated to increase through the life of the plan. Below are population projections for the *TriCounty RMP/EIS Planning Area*. (See population projection table below.)
Spaceport America	Spaceport America is the first purpose-built commercial spaceport in the world. Located a short distance from Truth or Consequences in southern Sierra County. Virgin Galactic is the spaceport's anchor tenant. Spaceport America has been providing commercial launch services since 2006. Phase One construction is now complete. Phase Two of the construction and pre-operations activities has begun and includes improvements to the vertical launch complex, the paving of the southern road to the spaceport, and the development of a world-class Visitor Center for students, tourists, and space launch customers.
SunZia Transmission Lines	SunZia Transmission, LLC, plans to construct and operate two 500-kilovolt (kV) transmission lines originating at a new substation in Lincoln County in the vicinity of Corona, New Mexico, and terminating at the Pinal Central Substation in Pinal County near Coolidge, Arizona.

County	Population Projections by Year		
	2020	**2030**	**2040**
Sierra	12,048	12,218	12,737
Otero	66,367	67,047	66,841
Doña Ana	243,164	273,513	299,088

Source: Bureau of Business and Economic Research, University of New Mexico (2002 [revised 2004])

Table 4-1. Past, Present, and Reasonably Foreseeable Future Actions (Concluded)	
Project/Action	**Description of the Action**
Union Pacific Intermodal Transfer Station	A proposed $400 million Union Pacific rail facility in Santa Teresa, New Mexico. The locomotive fueling station and intermodal freight yard are expected to create 3,000 jobs during 4 years of construction and to bring 600 permanent jobs once the facility is operating at full capacity in 2025. The facility, to occupy 2,200 acres, will include fueling facilities, crew change buildings, and an intermodal yard and ramp to load and unload up to 250,000 containers annually that are designed for seamless transfer among ships, trucks, and trains.
Lake Country Backcountry Byway	This Byway is nestled between the Mimbres and Caballo Mountains and the Cooke's Range in southwestern New Mexico over NM Highways 152 and 27 between Las Cruces and Truth or Consequences, near a string of lakes and reservoirs. Resource management decisions are forthcoming for the three counties affected by the Byway.
Mine Operations For Freeport McMoran At Cobre Mine	Future mining operations at Cobre's Continental Pit and Hanover Mountain Mine proposed action involves hauling copper ore to Chino's existing facility. Cobre is proposing to construct the connecting haul road to transport the Cobre ore to the Chino operations facility for processing. The total mine production rate for the Continental Pit and Hanover Mountain Mine at Cobre will range from about 20,000 to 125,000 tpd. The mining-related activities will commence after BLM approval and occur over a 10-year period.
Regional Grazing Permit Authorizations	The BLM will continue to issue permits for grazing on BLM-administered land.

Source: BLM 2012b.

4.3 ENVIRONMENTAL CONSEQUENCES

4.3.1 Proposed Action

Air Quality: The Copper Flat mine would have short- and medium-term minor adverse cumulative effects on air quality. Short-term effects would be limited to fugitive dust and heavy vehicle emissions during site preparation, while medium-term effects would be due to fugitive dust and heavy vehicle emissions during mine operation and reclamation. Other regional and national sources that have notable contributions to air quality impacts include vehicle travel, non-road mobile equipment, electrical generating units, fossil fuel production, and other transportation. By directly inventorying all emissions in nonattainment regions and monitoring concentrations of criteria pollutants in attainment regions, the State of New Mexico takes into account the effects of all past and present emissions in the state. This is done by putting a regulatory structure in place designed to prevent air quality deterioration for areas that are in attainment with the National Ambient Air Quality Standards (NAAQS) and to reduce common or criteria pollutants emitted in nonattainment areas to levels that would achieve compliance with the NAAQS (USEPA 2014d). This structure of rules and regulations is contained in the State Implementation Plan. State Implementation Plans include:

- State regulations that the U.S. Environmental Protection Agency (USEPA) has approved;
- State-issued, USEPA-approved orders requiring pollution control at individual companies; and
- Planning documents, such as area-specific compilations of emissions estimates and computer simulations (modeling analyses) demonstrating that the regulatory limits assure that the air quality would meet Federal and State standards (USEPA 2012e).

The State Implementation Plan process applies either specifically or indirectly to all activities in the region. Regional growth and contemporaneous actions would continue, including electrical generating activities, fossil fuel production, and changes in transportation infrastructure. Neither these nor any other large-scale projects or proposals have been identified that, when combined with the Proposed Action, would threaten the attainment status of the region, or would lead to a violation of any Federal, State, or local air regulation.

Climate Change and Sustainability: The short- and medium-term minor adverse cumulative effects to air quality described above would contribute negligible adverse impacts to climate norms due to the greenhouse gases (GHGs) emitted by the project from heavy vehicle emissions and the construction and operation of facilities. Other regional and national sources that have notable contributions to air quality via the emission of GHGs include vehicle travel, non-road mobile equipment, electrical generating units, fossil fuel production, and transportation. As described above, by directly inventorying all emissions in nonattainment regions and monitoring concentrations of criteria pollutants in attainment regions, the State of New Mexico takes into account the effects of all past and present emissions in the state. Regional growth and contemporaneous actions would continue, including electrical generating activities, fossil fuel production, and changes in transportation infrastructure. Neither these nor any other large-scale projects or proposals have been identified that when combined with the Proposed Action, would threaten the attainment status of the region, would have substantial emissions, or would lead to a violation of any Federal, State, or local air regulation.

When compared to the likely adverse effect of the past, present, and future projects that contribute to climate change, the current project would make a small contribution to the overall cumulative effect to climate change.

Water Quality: As noted in Chapter 3, there is some evidence that impacts to surface waters have occurred due to past mining and processing activities to a limited extent in the Greyback Arroyo. Similarly, groundwater monitoring down-gradient of the mining and mineral processing area (MMPA) indicates that there may have been groundwater impacts due to past mining and processing activities as well.

Groundwater flows in the vicinity of the MMPA run roughly from west to east, toward the Rio Grande Valley. Past activities that may have caused additive impacts at the MMPA include grazing and other mining activity. Grazing activity in the area would potentially increase the generation of suspended sediments and would likely have little to no impact on groundwater. Past mining activities are noted directly north of the tailings storage facility (TSF) (and denoted as “Strip Mines” on geologic maps). These past mining activities could have contributed to the impacts on groundwater observed in the down gradient monitoring wells in the Greyback Arroyo. Other than past mining-related activities, there appear to be no other past activities up-gradient of the MMPA that could have contributed or that may likely currently contribute to additive impacts to groundwater resources.

As for reasonably foreseeable future actions that may create additive impacts, most notable are the Proposed Action and alternatives. The expansion of the pit and associated waste areas (i.e., TSF) could contribute additional impacts to the currently impacted groundwater. However, because the pit is a hydrologic sink, impacts from the exposure of previously undisturbed material in the pit to pit lake water (i.e., groundwater inflow) would likely be minor. Additional waste added to the existing waste rock area would also potentially increase impacts to some extent. However, given the mitigation activities identified in Chapter 3 for the Proposed Action and alternatives coupled with the pit hydrologic sink and the low leaching potential of the waste and low-grade ore, any additional impacts to groundwater are likely minimal.

The proposed expansion of the TSF would also pose the potential for additional impacts to groundwater resources as the TSF is operated and ultimately dewatered. However, the additional development of the TSF would include the placement of an impermeable barrier on the older material prior to adding new material. This barrier would minimize the potential for leachate from the bottom of the new tailings to impact groundwater, but would also minimize the contact of the leachate with underlying material that would potentially add more contaminants. Accordingly, the potential for additive impacts associated with the TSF is minimal.

Other future activities down-gradient of the MMPA and within the potential affected area include grazing and transportation (i.e., roads and highways). These activities would likely contribute sediments and potentially various petroleum-derived contaminants. However, as previously discussed, these activities are not likely to impact groundwater and are not likely to contribute to the spectrum of groundwater contamination.

As with groundwater, the area of potential impact to surface water from past, current, and reasonably anticipated future actions is fairly limited around the footprint of the MMPA. Surface water run-on would be diverted around the existing mining operations and runoff generated from disturbed areas would largely be contained to minimize contact and downstream impacts. Any impacted runoff coming from the MMPA will discharge to an ephemeral drainage that runs only as a result of precipitation events. Samples from the Greyback Arroyo downstream of the MMPA show limited and probably transient impacts from past and present mining and processing activities.

The Proposed Action and alternatives do have the potential to contribute to surface water impacts in an additive fashion to current impacts. While the pit expansion would likely have little such impact, continued development of waste and low-grade ore storage areas and the TSF have the potential to impact surface water quality in the future. The marginal impacts from these expansions would cause a potential increase in suspended sediments, total dissolved solids, and metals in surface water. However, measures in place and within the Proposed Action and alternatives to control discharges from the MMPA to surface water such as sedimentation structures and berms would minimize these impacts.

There is a potential for grazing activities to have contributed or to contribute to suspended particulate loading to surface water in an additive manner upstream and downstream of the MMPA. Given recent extended drought conditions for the area, however, contributions from grazing activities may be somewhat overshadowed by impacts from reduction of stem density and cover. Related impacts would likely not contribute additional contamination normally expected for mining activities, such as total dissolved solids or dissolved or suspended metals.

Transportation-related activities (i.e., roads and highways) also have the potential to add to impacts to surface water from past, current, and future mining and processing activities. As with impacts to groundwater, however, most of the impacts would be due to releases of suspended particulate matter and petroleum derivatives that are not necessarily expected from mining and processing activities.

Surface Water Use: The Proposed Action and alternatives would reduce groundwater discharge to Caballo Reservoir and the Rio Grande, decreasing surface water quantities there. This impact is expected to have a long-term, large-extent, and probable cumulative effect on these surface water resources. The cumulative magnitude of the effect can only be determined through a comprehensive mid-basin study of Caballo Reservoir and the Rio Grande.

The existing and projected demands include existing diversions such as the 60,000 acre-feet per year of water delivered to Juárez, Mexico from Elephant Butte and Elephant Butte Irrigation District operations and water-supply projects. In addition, the populations of Sierra, Otero, and Doña Ana Counties are anticipated to increase through the life of the Proposed Action, potentially placing additional demand on surface water resources of the Rio Grande. The cumulative effects of the Proposed Action would be additive and occur primarily during active mining operations, when greater stream depletions are expected.

Severe droughts have occurred in the area of the Proposed Action and alternatives, most recently between 2007 and 2012. Droughts would also constitute a cumulative impact. Stormwater flows in tributary drainages to the Rio Grande would be reduced, as would direct rainfall on the Elephant Butte and Caballo Reservoirs.

Impacts from the Proposed Action and alternatives may be offset to a degree by watershed management practices and riparian habitat improvements. The Nonnative Phreatophyte/Watershed Management Plan and other restoration projects along the Rio Grande reduce the consumptive water use of floodplain vegetation by removing invasion species such as salt cedar and replacing them with native vegetation that requires less water.

Groundwater Use: Impacts to groundwater levels close to the mine pit would be permanent and thus cumulative to any future pumping that may occur in this area. There are currently no reasonably foreseeable future actions in this location identified in Section 4.2 that would require pumping of this nature. There is currently a lowered groundwater level that is a residual permanent effect for groundwater levels in the area of the existing pit resulting from previous mining activities at Copper Flat in 1982. The previous duration of mining operations was relatively short and the difference between current groundwater levels and historic levels is likely to be very small except in close proximity to the pit. The cumulative impact from the Copper Flat mine would incorporate the prior effect, and since the groundwater impact under all three alternatives evaluated in Chapter 3 is a significant impact, the cumulative impact would also be significant.

Mineral and Geological Resources: Due to the geographically limited nature of the Proposed Action, there would be no impacts associated with the Copper Flat mine that would affect any other assets in the region nor would any other activity affect mineral and geological resources within the mine area. As a result, the Copper Flat project would have a negligible cumulative effect on mineral or geological resources.

Soils: Soils in the Copper Flat project area near Hillsboro, New Mexico have been, and continue to be, destroyed or disturbed for such purposes as mining, community settlement, livestock grazing and ranching activities, construction of roads, operation and maintenance of ditches and canals, and urban development. Adverse impacts from these activities include soil compaction, channelization of runoff from impervious surfaces, erosion of soils and mass movement, loss of ecological function where soils are under water or impervious surfaces, and land subsidence. Drought could result in vegetation mortality leading to loss of cover and increased erosion, as well as drying of soils.

Adverse soils impacts associated with the Proposed Action and the action alternatives would be small as compared to cumulative past, present, and foreseeable future effects. As indicated above, because soil impacts would be mitigated through best management practices (BMPs) and implementation of the reclamation plan, cumulative impacts to soils in the immediate mine area would be small. Implementation of the Proposed Action or alternatives would contribute minor, adverse, cumulative impacts on soils.

Hazardous Materials and Solid Waste: Due to the geographically limited nature of the Proposed Action, there would be no impacts associated with hazardous materials required by the Copper Flat mine that would affect any other assets in the region nor would any other activity affect the use or safety of hazardous materials within the mine site. As a result, the Copper Flat project would have a negligible cumulative effect on hazardous materials and solid waste.

Wildlife and Migratory Birds: The overall cumulative impact of proposed activities on wildlife includes short-term detrimental impacts and long-term improvements to habitats. Surface disturbance associated with mineral development and forage use by livestock would result in cumulative effects over a larger area than is analyzed in this document. The combined surface disturbance of past, present, and future development would be detrimental to wildlife species due to fragmentation and destruction of habitat.

Detrimental impacts include loss and degradation of habitat due to mineral development, disruption of daily and seasonal animal movement and habitat use due to increased human presence, increased traffic volume and speeds, and noise and light pollution. Each disturbed area increases habitat fragmentation, reduces the connectivity and integrity of habitats, and displaces wildlife and special status species over the short- and long-term. The reasonably foreseeable development in the county from expansion of existing city areas and the development of large projects such as Spaceport America would impact wildlife species by degrading or removing habitat and disrupting normal behavior. Although mitigation and reclamation could reduce the adverse impacts in the long term (perhaps resulting in improved habitat for the population), the Proposed Action could result in the displacement of the population in the short term or the loss of the local population in the long term.

Beneficial impacts would occur after mine restoration of the project site and from the Rio Grande improvements, Nonnative Phreatophyte/Watershed Management Plan, New Mexico Environment Department Watershed Restoration Action Strategy, and any nearby mine reclamation, in addition to activities based on wildlife and land management planning efforts that are currently underway.

Vegetation and Non-native Invasive Species: Vegetation in the Copper Flat project area has been, and continues to be, cleared or disturbed for such purposes as mining, community settlement, livestock grazing and ranching activities, construction of roads, operation and maintenance of ditches and canals, and urban development. These activities involve removal, trampling, or destruction of vegetation; disturbance of ground cover; and introduction of invasive species. Many of these actions also contribute to soil compaction and erosion, making it more difficult for native plant species to re-inhabit an area after disturbance. Additionally, pressure from increasing human presence includes trampling of vegetation due to pedestrian traffic, and concentrated areas of foot traffic which removes vegetation and fragments habitat and vegetative populations. Climate change could lead to increased drought and floods, further removing native vegetation as both drought and flooding could result in vegetation mortality and an increase in invasive species.

Beneficial effects of past, present, and foreseeable future actions also exist. Restoration improvements along the Rio Grande, including reducing the consumptive water use of floodplain vegetation by improving riparian habitat (i.e., removing salt cedar and planting native vegetation) would enhance native riparian communities and require less water. The Nonnative Phreatophyte/Watershed Management Plan focuses on the prevention and control of salt cedar and associated nonnative invasive plants with the ultimate goal of restoring healthy, productive ecosystems. The plan will facilitate management and implementation of future control practices and rehabilitation efforts in New Mexico's watersheds and riparian areas.

Adverse vegetation impacts associated with the Proposed Action and the action alternatives would be small compared to cumulative past, present, and foreseeable future effects. The cumulative impact on vegetation from past, present, and future actions would be adverse and moderate. Implementing the Proposed Action would contribute minor adverse cumulative impacts on vegetation.

Threatened and Endangered Species and Special Status Species: Mining development and operation activities would add a minor increment to an array of other factors to slightly increase overall adverse cumulative effects. Mitigation measures and proper reclamation would reduce or offset and may improve overall cumulative effects, particularly after mining ceases.

Agriculture, grazing, development, groundwater use, and channelization of creeks for agriculture and development contribute to the loss and fragmentation of habitat available for special status species. Surface water management of the perennial rivers and reservoirs by Federal and State agencies also contribute to the loss and creation of riparian habitat suitable for the yellow-billed cuckoo and Chiricahua leopard frog. Climate change could lead to increased drought and floods, further removing depleting native upland vegetation and riparian communities, as both drought and flooding could result in plant mortality and an increase in non-native species.

Beneficial effects of past, present, and foreseeable future actions also exist or would exist. The Non-native Phreatophyte/Watershed Management Plan (NMDA 2005) focuses on the management and implementation of future control practices and rehabilitation efforts in New Mexico’s watersheds and riparian areas that provide habitat for special status species. Such restoration improvements along the Rio Grande, including reducing the consumptive water use of floodplain vegetation by improving riparian habitat (i.e., removing salt cedar and planting native vegetation) would enhance native riparian communities, require less water, and improve habitat suitable for special status species.

Land Use and Land Ownership: Land tenure at the mine would not change during the life of the mine based on any known past, present, or reasonably foreseeable projects. The land status and prior rights currently held by parties would remain unchanged. However, the overall land use at the mine would be restricted to mining operations. The mine operator would lease private and use Federal surface estates and Federal mineral estates from the BLM for the life of the mine and until the mine area has been reclaimed and released from bond. Land uses in and around the mining area would not be changed until after reclamation and the final land use would be congruent with previous land use.

Land use of the area may change as development spreads from existing communities or areas are developed for oil, gas, or other mining activities. Although the land use would change from inactive to active mining, the land use category would not change. In addition, permitting requirements would assure compliance with existing land use regulations for areas of the proposed project. Because the land use category would not change and land use regulations would be followed the cumulative impacts would be expected to be negligible under the Proposed Action and alternatives.

Other activities may impact land use and land ownership in the areas around the proposed project as land is developed, but these projects would also be subject to permitting based on land management. After reclamation is complete, impacts may be beneficial due to enhancement of the area, though these impacts would not be incongruent with existing plans or permitting, and therefore cumulative impacts would be expected to be minor.

Recreation: The population growth projected in the TriCounty RMP/EIS Planning Area would contribute to an increased demand for recreational amenities in the region surrounding the Copper Flat mine. This growth is anticipated to lead to a simultaneous increase in regional traffic, which would be additive to the increase in traffic that would result from the use of the access road to the Copper Flat site. Some of this traffic may be mitigated by the transportation projects planned by the New Mexico Department of Transportation - Region 1, but some would cause increased traffic on the Lake Valley Backcountry Byway and the Geronimo Trail Scenic Byway. As described in Table 4-1, resource management decisions are forthcoming for the three counties affected by the Lake Valley Backcountry

Byway. Cumulative impacts to the pace of scenic driving on the byways are anticipated to be adverse, minor, and medium- to long-term. Transportation impacts are described further in Section 3.20.

No recreation projects are proposed in the immediate vicinity of the Copper Flat site. Thus, cumulative visual impacts, as they pertain to recreational viewers' perception of a site, would be nonexistent. It is unlikely that recreational activities at Spaceport America would be impacted by the development and operation of the Copper Flat mine.

When compared to the likely adverse effect of the past, present, and future recreation projects in the area, the current project would make a small contribution to the overall cumulative effect to recreation. Thus, at a regional level, the cumulative effect of the proposed Copper Flat mine on recreation would be negligible to minor.

BLM Special Management Areas: Negligible to moderate, probable, short- and medium-term impacts are anticipated to Special Management Areas (consisting only of the Byways located in the project region). These impacts may be exacerbated by future development projects within the vicinity of the project area. The population growth projected in the TriCounty RMP/EIS Planning Area would contribute to an increased demand for infrastructural and recreational amenities in the region surrounding the Copper Flat mine. This growth is anticipated to lead to a simultaneous increase in regional traffic, which would be additive to the increase in traffic that would result from the use of the access road to the Copper Flat site. However, construction and operation proposed under the Copper Flat mine project would likely not preclude the designation of any future areas as Special Management Areas.

Range and Livestock: Range conditions and available forage in the area surrounding the Copper Flat Mine and near Hillsboro, New Mexico have been and continue to be changed for mining, livestock grazing and ranching activities, road construction, and rural development. These activities involve disturbance of vegetation and potential for introduction of invasive species, which could impact availability and quality of forage for livestock. Rangeland conditions are assessed periodically against the New Mexico Standards and Guidelines and permitted use of BLM land for grazing is adjusted accordingly. These assessments and adjustments facilitate long-term maintenance of the range resources for multi-use management. As a result, there would be a negligible cumulative effect on range and livestock assets.

Transportation and Traffic: The proposed Copper Flat mine would introduce increased traffic and roadway deterioration in localized areas. There are no known past, present, or future actions that would significantly affect the level of service or roadway degradation above that which would be experienced by the proposed construction, mining operation or closure and reclamation of the Copper Flat mine. As a result, the Copper Flat project would have a negligible cumulative effect on the overall transportation environment.

Noise: The Copper Flat project would introduce medium-term minor increases to the noise and vibration environments from the use of mining and mineral processing equipment, general heavy equipment use, drilling, and blasting. Due to the remote location of the site these increases would be less than significant. No other projects have been identified that, when combined with the Proposed Action, would have greater than significant effects. As a result, the Copper Flat project would have a negligible cumulative effect on the overall noise environment.

Socioeconomics, Public Services, and Economic Development: In conjunction with other developments in and around Sierra County, the proposed project would result in probable large long-term and beneficial cumulative impacts. It would create additive, synergistic, cumulative impacts to the local economy, affecting population growth, employment rates, earnings per capita, total compensation of employees, and recreation and tourism revenues. These projects would support several billion dollars in economic activity and represent significantly beneficial cumulative impacts to Sierra County over the coming decades – though they would not represent a source of permanent prosperity.

The socioeconomic impact of this proposed mine is a matter of interest due to historical boom and bust cycles that have occurred with some mines in the region and elsewhere. Some other mining projects have been risky investments – as exemplified by Quintana Minerals Corporation's short-lived mining operations in 1982, when after 3 months the price of copper decreased and the mine closed. The synergistic effect or spin-off activities associated with both the proposed project and other development projects listed in Table 4-1 (especially mine operations at Cobre Mine) could be strongly linked to or reliant on the mining sector. Spin-off development and businesses growing or shrinking in tandem with the mining sector would therefore contribute to a "boom" and have an additive, synergistic effect on beneficial impacts; but with NMCC's involvement a "bust" could be avoided that would have an additive, synergistic effect on adverse impacts.

Environmental Justice: Mine operations at Cobre Mine in Grant County, when added to the proposed project, would create cumulative impacts to low-income populations that would be probable, large, long-term, and beneficial in nature. Though the two mines would not occur in the same county and many of the jobs created would likely be filled by respective county residents, a portion could travel from outside the respective economic regions for work at either mine. For example, a Sierra County resident could travel to the adjacent Grant County for a job at the Cobre mine; and a Grant County resident could travel to Sierra County for a job at the Copper Flat mine. Others could cross counties for jobs created by the spin-off or related development that would likely follow construction activities at both mines (e.g., restaurants, hotels). If both mines re-open and operate, potential economic cumulative effects on low-income populations would likely be minor to moderately beneficial as it relates to environmental justice.

A boom and bust socioeconomic cycle can more heavily impact environmental justice populations. Once environmental justice communities and populations become dependent on the mining boom economy, it is often difficult to maintain the same standard of living and quality of life after the boom ends. Positive and negative health impacts associated with increased employment could disproportionately impact low-income workers hired by either mine. Cumulative impacts associated with boom and bust cycles on low-impact populations would likely be additive and synergistic and could be adverse or beneficial.

Cultural Resources: Past actions in the region such as livestock grazing, mining, development of military installations, water management and irrigation, and activities associated with expanding communities (namely economic development and infrastructure improvements) likely resulted in the destruction of historic properties (i.e., significant cultural resources). Those impacts that occurred in the 1970s and later that involved Federal agency oversight would have included mitigation of effects to historic properties. As populations expand, and the need for development continues, historic properties in the region will continue to be adversely affected by present and future land-disturbing developments, with those affects occurring on Federal land being mitigated.

For historic properties, the destruction of and damage to properties over time occurs on a property-by-property basis. Cumulative effects, if they exist, are most likely to occur at a regional level rather than to a single property. It is expected that the Proposed Action or either of the action alternatives would result in adverse effects to multiple historic properties. These effects would be additive to those that have occurred or will occur throughout the region as a result of past, present, and reasonably foreseeable actions. When compared to the likely adverse effect of the past, present, and future actions on historic properties, the current project will make a small contribution to the overall cumulative effect to historic properties in the region. Thus, at a regional level, the cumulative effect of the proposed Copper Flat mine on historic properties would be minor.

Visual Resources: The area of potential effect for the Proposed Action is in the Basin and Range province, which has a landscape character typical to the province of broad, open basins bounded by prominent mountain ranges and covered by pinon-juniper vegetation (USFS 2009). The area is located within the foothills of the Black Range, which is a major north-south mountain chain in south-central New Mexico. Past and present actions have contributed to modifications to the characteristic landscape in the area of analysis including mechanical vegetation treatments, transmission lines and other linear rights-of-way. Future actions that would contribute to cumulative impacts to visual resources of the landscape consist of other mining activities, additional vegetation treatments and restoration activities, oil and gas exploration and production, and development of pipelines and power lines. (See Table 4-1.)

Over the next 20 years, reasonably foreseeable future development would change the character of the existing landscape. Reasonably foreseeable actions would potentially remove vegetation by grazing and land treatment methods, change landform by surface disturbance during mining and road building, and introduce linear structures to the landscape including power lines and pipelines. These developments would introduce moderate to noticeable changes to visual resources. Mitigation measures would be implemented to return the tract to a more natural landscape as pit activities are completed. The analysis assumes that mitigation measures for visual resources would be implemented with reasonably foreseeable future projects to reduce contrasts. Cumulatively, contrasts would remain consistent with the BLM visual resource management Class III objectives in the area of analysis.

Human Health and Public Safety: Human health and safety hazards from the proposed mining activity anticipated by the Proposed Action or either of the two alternatives by their nature are largely confined to the mine area where the activity occurs. These actions would therefore have little or no cumulative effect on past, present, or future activities identified in this chapter that are external to the mine area.

One exception to this is the previous mining activity that occurred at the Copper Flat mine area. Past expectations at the time of previous mine reclamation were not as comprehensive as they are today. The result is that existing conditions at the mine area are likely more hazardous than they would be under natural conditions.

With closure of the mining operations and the ensuing land reclamation, it is reasonable to expect that conditions at the mine area would be restored to a more natural condition that would be an improvement over conditions present at the start of mining operations. This would create a net beneficial effect for human health and public safety over the long term. Areas such as the remaining open pit and lake that may pose a safety hazard would have access restricted to the general public.

The mine safety training provided to workers at the mine area would raise the collective awareness of general safety and health issues in the local communities where many of the workers reside, resulting in a slightly beneficial cumulative effect in these communities and for other present and future activities identified in this chapter.

Utilities and Infrastructure: Due to the geographically limited nature of the Proposed Action and the lack of reliance on public utilities and infrastructure, there would be no impacts associated with the Copper Flat mine that would affect any other utilities and infrastructure in the region, nor would any other activity associated with public utilities and infrastructure affect the mine area. As a result, the Copper Flat project would have a negligible cumulative effect on utilities and infrastructure in the region.

Paleontological Resources: As discussed in Section 3.26, no paleontological resources of critical or educational value have been identified within the proposed mine area. The section also concludes that conditions within the mine area are not conducive to fossil discovery or impacts as a result of mine development, operations, closure or reclamation. Despite these findings, an environmental protection measure for paleontological resources would be employed as discussed in Section 2.1.16 to protect paleontological discoveries. On the basis of these determinations and protection measures, there are no cumulative effects expected for paleontological resources.

4.3.2 Alternative 1

The cumulative impacts associated with the mining development of Copper Flat for Alternative 1 would be virtually the same as with the Proposed Action.

4.3.3 Alternative 2

The cumulative impacts associated with the mining development of Copper Flat for Alternative 2 would be virtually the same as with the Proposed Action.

4.3.4 No Action Alternative

Under the No Action Alternative, there would be no mining activities at Copper Flat. As a result, there would be no impacts associated with the various resource areas previously discussed. There would also be no restoration or reclamation of the Copper Flat properties beyond those from previously authorized activities; they would remain in the state they are today. Since there would be no impacts associated with the mining, restoration, or reclamation of the property, there would be no cumulative impacts associated with Copper Flat.

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CHAPTER 5

CONSULTATION AND COORDINATION

CHAPTER 5. CONSULTATION AND COORDINATION

An Environmental Impact Statement (EIS) must be prepared when a Federal government agency considers approving an action within its jurisdiction that may impact the human environment. An EIS aids Federal officials in making decisions by presenting information on the physical, biological, and social environment of a proposed project and its alternatives. The first step in preparing an EIS is to determine the scope of the project, the range of action alternatives, and the impacts to be included in the document.

This EIS has been prepared with input from and coordination with interested tribal governments, agencies, organizations, and individuals. The Council on Environmental Quality (CEQ) regulations [40 Code of Federal Regulations (CFR) 1500–1508] require an early scoping process to determine the issues related to the Proposed Action and alternatives that the EIS should address. The purpose of the scoping process is to identify important issues, concerns, and potential impacts that require analysis in the EIS and to eliminate insignificant issues and alternatives from detailed analysis. Public involvement is a vital component of the National Environmental Policy Act (NEPA) for vesting the public in the decision making process and allowing for full environmental disclosure.

5.1 PUBLIC INVOLVEMENT

The purpose of scoping is to provide an opportunity for members of the public to learn about the proposed mine reopening and to share any concerns or comments they may have. Input from the public scoping process is used to help the BLM identify issues and concerns to be considered in the EIS, as well as to identify potential alternatives. In addition, the scoping process helps to identify any issues that are not considered relevant and that can therefore be eliminated from detailed analysis in the EIS. The list of stakeholders and other interested parties is also updated and generally expanded during the scoping process.

On January 9, 2012, the BLM Las Cruces District Office (LCDO) published a Notice of Intent (NOI) in the Federal Register (vol. 77, no. 5, p. 1080-1081, Doc 2012-125) to prepare an EIS for this project. The NOI also noted that public scoping meetings would be held with 15 days prior notification in local media. These notices were in the *Albuquerque Journal*, *The Herald*, and the *Las Cruces Sun News* on February 7, 2012. Additionally, BLM ran notices in *the Las Cruces Bulletin* and the *Sierra County Sentinel* on February 10, 2012. Solv created a project website to inform the public of the NEPA process, and it included notice of these public scoping meetings. Solv sent a news release to local television stations and radio stations: KFOX – Las Cruces Bureau, KDBC 4 CBS, KVIA Channel 7, NewsChannel 9 (KTSM), KRWG-TV/FM MSC TV 22-NMSU, KINT TV Univision 26, Telemundo 48, KOB Channel 4, KOAT Channel 7, KVLC 101.1FM, KGRT, and KRWG.

The BLM hosted two scoping meetings in Hillsboro and Truth or Consequences, New Mexico, on February 22 and 23, 2012, respectively, to provide the public with an opportunity to learn about the project and provide comments. The meeting in Hillsboro was held at the Hillsboro Community Center, and the meeting in Truth or Consequences was held at the Truth or Consequences Civic Center. Public participants at the meetings numbered 59 in Hillsboro and 72 in Truth or Consequences.

There was an open house portion of the meeting to encourage discussion and information sharing and to ensure that the public had opportunities to speak with representatives of the BLM LCDO, the State of New Mexico, and New Mexico Copper Corporation (NMCC). Several display stations with exhibits, maps, and other informational materials were staffed by representatives of the BLM LCDO, the State of New Mexico Minerals and Mining Division, the New Mexico Environment Department, NMCC, and Solv. Meeting attendees were requested to sign in upon entering, at which time they were provided with handouts and informed about the meeting format and how to comment at the meeting. The handouts and displays provided information about the NEPA process, project background, list of cooperating agencies, a fact sheet about the BLM LCDO, and how to provide comments. The open house session was followed by a presentation and public comment session. The BLM, Solv, and NMCC all spoke during the presentation.

A 30-day scoping comment period (January 9, 2012 through March 9, 2012) was provided in order for the public to submit comments related to potential issues via email, mail, fax, project website, or project phone answering system. A total of 94 individuals submitted comments.

5.1.1 Mailing List

A mailing list identifying individuals (as points of contact) in organizations, agencies, and interest groups was used to provide information about the public meetings, scoping period deadlines, and other key milestones. The BLM mailing list was used as the foundation but was periodically revised, updated, and expanded throughout the scoping period and was further updated throughout the entire NEPA process. Individuals who signed in at either of the public meetings or submitted comments during the scoping period were automatically added to the mailing list unless they stated that they did not want to be added or did not want to receive additional information as the project progressed.

The first direct mailing related to the EIS process occurred on February 6, 2012 included 206 recipients, distributed by either regular mail or electronic mail. The mailing provided information about the Proposed Action, announced scoping meetings and locations, and provided information about how to submit comments. A second mailing at a time when the draft EIS is released will include a summary of the draft EIS and the alternatives that were analyzed, along with information about the comment period, how to review the EIS and how to comment, and the dates, times, and locations of all public review meetings. A third mailing will announce availability of the Final EIS, and a fourth mailing will announce availability of the Record of Decision (ROD).

The following agencies, organizations, and individuals were notified that the Draft EIS would be available in paper copy, on compact disc (CD), and on the BLM's Web site. Some have requested and will receive a paper copy or CD of the Draft EIS for review and comment. BLM will send copies of the Final EIS to the same entities listed below and to those who request a copy.

FEDERAL AGENCIES

Department of the Interior
- Bureau of Land Management
  - Washington Office, D.C.
  - New Mexico State Office
  - Las Cruces District Resource Advisory Council
- Bureau of Indian Affairs
- National Park Service
- Office of Environmental Policy and Compliance
  - Regional Office, Albuquerque
- Bureau of Reclamation
  - International Boundary and Water Commission Upper Rio Grande Project
- Fish and Wildlife Service
  - Las Cruces, New Mexico
  - Albuquerque, New Mexico

U.S. Army Corps of Engineers
    Albuquerque District
U.S. Department of Agriculture
    Forest Service, Regional Office
U.S. Environmental Protection Agency
    Region 6
U.S. Geological Survey
Minerals Management Service
Office of Surface Mining
U.S. Department of Transportation

STATE AGENCIES AND ORGANIZATIONS

Governor, State of New Mexico
New Mexico Department of Agriculture
New Mexico Department of Game and Fish
New Mexico Environment Department
New Mexico Energy, Minerals, and Natural Resources Department
    Mining and Minerals Division
    State Forestry Division
New Mexico Office of the State Engineer
New Mexico State Historic Preservation Office
New Mexico State Land Office
New Mexico Department of Transportation
New Mexico Indian Affairs Department
New Mexico Bureau of Mine Safety

LOCAL GOVERNMENTS

City of Truth or Consequences, New Mexico
    City Manager
    Chamber of Commerce
    Public Library
City of Elephant Butte
Community of Hillsboro
    Library
Sierra County, New Mexico

TRIBAL GOVERNMENTS

Comanche Indian Tribe
Kiowa Tribe of Oklahoma
Mescalero Apache Tribe
Fort Sill Apache Indian Tribe
White Mountain Apache Indian Tribe
Hopi Tribal Council
Isleta Pueblo
Navajo Nation
Ysleta del Sur Pueblo
Zuni Pueblo

CONGRESSIONAL/LEGISLATORS

Senator Tom Udall, State of New Mexico
Senator Jeff Bingaman, State of New Mexico
Representative Steve Pearce, 2nd Congressional District of New Mexico
John Arthur Smith, State Senator District 35
Dianne Hamilton, State Representative District 38

OTHER INTERESTED ORGANIZATIONS

New Mexico Wilderness Alliance
Sierra Club, New Mexico Chapter
The Wilderness Society
New Mexico Wildlife Federation
Ladder Ranch
Tetra Tech
Copper Flat Allotment
Chino Mines Company
New Mexico Environmental Law Center
Elephant Butte Irrigation District
Gila Resources Information Project

5.2 CONSULTATION WITH TRIBAL GOVERNMENTS

Federal agencies are required to consult with American Indian tribes (Tribes) as part of the Advisory Council on Historic Preservation Regulations, Protection of Historic Properties [36 CFR 800], implementing Section 106 of the National Historic Preservation Act (NHPA). Accordingly, NHPA outlines when Federal agencies must consult with Tribes and the issues and other factors this consultation must address. In addition, pursuant to Executive Order (EO) 13175, executive departments and agencies are charged with engaging in regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications and are responsible for strengthening the government-to-government relationship between the United States and Indian tribes.

As a Federal agency, BLM has a trust responsibility to Tribes to protect tribal cultural resources and to consult with Tribes regarding those resources. Certain laws, regulations, and executive orders guide consultation with American Indians to identify cultural resources important to Tribes and to address tribal concerns about potential impacts to these resources. Section 101(d)(6) of the NHPA mandates that Federal agencies consult with Tribes and other Native American groups who either historically occupied the project area or may attach religious or cultural significance to cultural resources in the region. NEPA implementing regulations link to the NHPA, as well as the American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Religious Freedom Restoration Act, EO 13007, EO 13175 Consultation and Coordination with Indian Tribal Governments (65 FR 67249), and the Executive Memorandum on Government-to-Government Relations with Native American Tribal Governments (59 FR 22951). This body of legislation calls on agencies to consult with American Indian tribal leaders and others knowledgeable about cultural resources important to them. BLM manual 8120 and handbook H-8120-1 address tribal consultation specifically, and the subject is addressed in terms of Section 106 of the NHPA in the nationwide Programmatic Agreement and New Mexico Protocol. The BLM consulted with Tribes during development of this draft EIS, and this consultation will continue through development of the final EIS.

Consultation with Tribes is required under multiple Federal and State statutes. The purposes of consultation are to elicit from tribal representatives concerns for potential impacts from the proposed project on the Tribe or resources that are significant to the Tribe, and to identify possible mitigation measures to resolve or minimize potential impacts. Formal consultation under NEPA and Section 106 was initiated with a scoping letter sent to the public, including Tribes, on February 3, 2012. No responses to these letters were received from Tribes or tribal members, and no tribal representatives attended the public scoping meetings held on February 22, 2012 in Hillsboro, New Mexico and February 23, 2012 in Truth or Consequences, New Mexico.

Tribal consultation letters were sent on November 7, 2012, to the Comanche Indian Tribe, Fort Sill Apache Tribe, Hopi Tribe, Isleta Pueblo, Kiowa Tribe, Mescalero Apache Tribe, Navajo Nation, White Mountain Apache Tribe, Ysleta del Sur Pueblo, and Zuni Pueblo. The letters described the proposed Copper Flat mine project and requested information from the Tribes on any concerns they had for potential impacts to tribally-significant resources.

Two Tribes provided responses:

1. The Hopi Tribe sent a letter stating their desire to continue consultation because they believe that archaeological sites with which they are affiliated would potentially be impacted by the proposed project. They asked to receive copies of the final archaeological survey reports and the draft EIS.
2. The White Mountain Apache Tribe stated that unless human remains or materials related directly to them were discovered, they were not interested in further consultation.

During the time between the availability of this draft EIS and the issuance of the final EIS and the BLM's ROD, consultation with the Tribes by the BLM and State agencies will continue to ensure that Tribal concerns are understood and presented in the documentation, to identify appropriate mitigation measures, and to fulfill the requirements of relevant Federal and State statutes. Consultation with the Tribes regarding the proposed project may also continue beyond the ROD, in a manner determined during development of mitigation measures.

5.3 LIST OF PREPARERS

This EIS was prepared and reviewed by a team from the BLM. A team associated with Solv assisted the BLM in conducting research, gathering data, and preparing the EIS and supporting documents. Table 5-1 identifies team members and their roles.

Table 5-1. List of Preparers

Table 5-1. List of Preparers		
Organization	**Name**	**Project Role**
BLM	Anthony Hom	Realty
BLM	Corey Durr	Water; Soil; Air Quality; Climate Change and Sustainability
BLM	Dave Legare	Cultural Resources
BLM	Douglas Haywood	Lead Agency Project Manager
BLM	Jack Barnitz	Wildlife – Frogs
BLM	James Renn	Paleontological Resources
BLM	Jennifer Montoya	NEPA Manager; Socioeconomics; Environmental Justice; Land Use
BLM	Jim Salas	Website
BLM	Joe Sanchez	Recreation
BLM	Leighandra Keeven	Geology
BLM	Margie Guzman	Wildlife
BLM	Mike Williams	Transportation and Traffic; Utilities and Infrastructure
BLM	Ray Hewitt	Geographic Information Systems
BLM	Rena Gutierrez	Public Involvement
BLM	Russell Stovall	Hazardous Materials; Human Health and Public Safety
BLM	Shannon Gentry	Range and Livestock; Vegetation
BLM	Tim Frey	Wildlife – Fish
BLM	Tom Phillips	BLM Special Management Areas; Visual Resources; Wilderness
BLM	Vanessa Duncan	Noise and Vibration
Solv	Chelsie Romulo	Website; Comments; Visual Resources; Land Use and Land Ownership; Lands and Realty; Wildlife and Migratory Birds
Solv	Dave Henney	Contract Project Manager
Solv	Eveline Martin	Soils; Vegetation and Non-native Invasive Species
Solv	Marissa Staples	BLM Special Management Areas, Climate Change and Sustainability; Recreation; Document Management
Solv	Pam Sarlouis	Document Formatting and Preparation
Solv	Mary Peters	Threatened and Endangered Species and Special Status Species, Range and Livestock
Solv	Nathalie Jacque	Socioeconomics and Economic Development; Environmental Justice
Solv	Steve Shiell	Deputy Project Manager; Author for Section 2 (Proposed Action & Alternatives); Transportation & Traffic; Cumulative Impacts
Solv	Tim Lavallee	Air Quality; Noise and Vibration
CDM Smith	Todd Bragdon/Brian Munson	Water Quality
DBSA	Paula Schuh	Surface Water Use
DBSA	Julie Kutz	Hazardous Materials and Solid Waste/Waste Disposal
LWA	Lee Wilson	Groundwater Use; Mineral and Geologic Resources
Southwest Planning	Chris Cordova	Utilities and Infrastructure
Van Citters Historic Preservation	Katherine Roxlau	Cultural Resources Lead

REFERENCES

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REFERENCES

ABC 1996. Adrian Brown Consultants. Appendix F of Copper Flat project hydrology impact evaluation report, surface water characterization. Prepared for S. Steffen Robertson and Kristen, Report 1356A/960909. September 9, 1996.

Abkowitz, M., Eiger, A., and Sirinivasan, S. 1984. Estimating the Release Rates and Costs of Transporting Hazardous Waste. Obtained from the National Service Center for Environmental Publications (NSCEP), U.S. Environmental Protection Agency (USEPA). Website http://www.epa.gov/nscep/index.html

Admaveg, Inc. 2014. Sierra County, New Mexico. Accessed September 13, 2014 at http://www.city-data.com/county/Sierra_County-NM.html.

AMA 2012. Arizona Mining Association. 2013. The Economic Impact of the Mining Industry on the State of Arizona 2012. Accessed February 2015 at http://www.azmining.com/uploads/2012%20AZ%20Mining%20Economic%20Impact%20Study_1.pdf.

AMEC 2012. AMEC Environment and Infrastructure, Inc. Study “NM-152 Pavement Condition Assessment” dated 29 October 2012.

ANSI 2013. American National Standard Institute. 2013. American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound. Part 3: Short-term measurements with an observer present. ANSI S12.9-1993 (R2013)/Part 3.

ARC 2011. Architectural Research Consultants. 2011-2016. Truth or Consequences Municipal School District Facilities Master Plan, 2011-2016. Accessed September 13, 2013 at http://www.nmpsfa.org/pdf/MasterPlan/FMP/T_or_C/TorC_FMP_2011_Vol_1.pdf.

ATSDR 2011. Agency for Toxic Substances and Disease Registry. 2011. ToxFAQs™: Automotive Gasoline. Accessed June 2012 at http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=467&tid=83.

ATSDR 2004. Agency for Toxic Substances and Disease Registry. 2004. Public Health Statement: Copper. Accessed June 2012 at http://www.atsdr.cdc.gov/ToxProfiles/tp132-c1-b.pdf.

ATSDR 1999. Agency for Toxic Substances and Disease Registry. 1999. Toxic Substances and Disease Registry ToxFAQs: Silver. Accessed June 2012 at http://www.atsdr.cdc.gov/toxfaqs/tfacts146.pdf.

Bartley, M. 1994. Unemployment and Ill Health: Understanding the Relationship. Journal of Epidemiology and Community Health. 48:333-337.

BBER 2007. Bureau of Business and Economic Research, University of New Mexico. 2007. Socioeconomic Assessment of the Gila National Forest (Submitted to the U.S. Forest Service Region 3 Office). Accessed September 13, 2014 at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_021519.pdf.

Beeghley, L. 2004. The Structure of Social Stratification in the United States. New York, NY: Pearson.

Beier, P. 2005. Effects of artificial night lighting on terrestrial mammals. In Ecological Consequences of Artificial Night Lighting, edited by T. Longcore and C. Rich, pp. 19–31. Island Press, Washington, D.C.

Benson, C.H.; Albright, W.H.; and Kelsey, J.A. 2011. Short Course Presentation, USEPA Region 9, San Francisco, CA, http://www.epa.gov/osp/presentations/PhytoWBC11/wb_Benson1.pdf, accessed October 6, 2014.

Berke, P.; Godschalk, D.R.; and Kaiser, E. 2006. Urban Land Use Planning. Fifth Edition. Urbana and Chicago: University of Illinois Press.

Blickley, J. and Patricelli, G. 2010. Impacts of Anthropogenic Noise on Wildlife: Research Priorities for the Development of Standards and Mitigation. Journal of International Wildlife Law & Policy, 13:274–292.

BLM 2014. Bureau of Land Management. 2014. Authorized Use by Allotment Report, Las Cruces District Office. Rangeland Administration System. Accessed online October 2014 at http://www.blm.gov/ras/.

BLM 2013. Bureau of Land Management. 2013. TriCounty Draft Resource Management Plan/Environmental Impact Statement. April 2013. Available online at http://www.blm.gov/nm/st/en/fo/Las_Cruces_District_Office/tricounty_rmp.html.

BLM 2012. Bureau of Land Management. 2012. Tri-County Resource Management Plan and Environmental Impact Statement- Chapter 3 Affected Environment. 110 pp.

BLM 2012a. Bureau of Land Management. 2012. HB In-Situ Project Environmental Impact Statement; 1.0: Intro. Accessed November 2012 at http://www.nm.blm.gov/cfo/HBIS/docs/f_1.0_Intro.pdf.

BLM 2012b. Bureau of Land Management. 2012. Personal communication: Katie Emmer with Steve Shiell of Solv.

BLM 2011. Bureau of Land Management. 2011. Biological Resources Survey Report, Copper Flat Pipeline and Well Sites, Sierra County, New Mexico. Prepared by Parametrix. August 2011.

BLM 2011a. Bureau of Land Management. 2011. Mining Laws. Accessed June 2012 at http://www.blm.gov/wo/st/en/info/regulations/mining_claims.html.

BLM 2011b. Bureau of Land Management. 2011. Rights-of-Way. Accessed June 2012 at http://www.blm.gov/wo/st/en/prog/energy/cost_recovery_regulations.html.

BLM 2010. Bureau of Land Management. 2010. Visual Resource Inventory for the Las Cruces District, Bureau of Land Management.

BLM 2008. Bureau of Land Management. 2008. Special Status Species Management Manual 6840. Release 6-125. December 12, 2008. Available online at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/im_attachments/2009.Par.13736.File.dat/IM2009-039_att1.pdf.

BLM 2008a. Bureau of Land Management. 2008. Bureau of Land Management-Energy and Mineral Policy. 2 pp.

BLM 2006. Bureau of Land Management. 2006. TriCounty Resource Management Plan/Environmental Impact Statement, Analysis of the Management Situation. June 2006. Available online at http://www.blm.gov/nm/st/en/fo/Las_Cruces_District_Office/tricounty_rmp.html.

BLM 2001. Bureau of Land Management. 2001. Record of Decision, New Mexico Standards for Public Health and Guidelines for Livestock Grazing. New Mexico State Office. January 2001. Available online at http://www.blm.gov/pgdata/etc/medialib/blm/nm/field_offices/nmso/nmso_planning/nmso_misc_planning.Par.47309.File.dat/memo-RMPA.pdf.

BLM 1999. Bureau of Land Management. Preliminary final environmental impact statement, Copper Flat project. Prepared by ENSR, Fort Collins, Colo., 491 p.

BLM 1996. Bureau of Land Management. . 1996. Draft Environmental Impact Statement: Copper Flat Project. Accessed at https://archive.org/stream/environmentalimp00unit_0/environmentalimp00unit_0_djvu.txt.

BLM 1995. Bureau of Land Management. 1995. Manual 8550: Interim Management Policy and Guidelines for Lands Under Wilderness Review. Accessed June 2012 at http://www.blm.gov/ca/pa/wilderness/wilderness_pdfs/wsa/ManualTransmittalShe.pdf.

BLM 1988. Bureau of Land Management. 1988. Manual 1613: Areas of Critical Environmental Concern. Accessed June 2012 at http://www.blm.gov/pgdata/etc/medialib/blm/id/plans/four_rivers_rmp_eis.Par.10819.File.dat/1613_ACECs.pdf.

BLM 1986. Bureau of Land Management. 1986. White Sands Resource Area Resource Management Plan. 64 pp.

BLM 1984a. Bureau of Land Management. 1984. Manual 8400 - Visual Resource Management.

BLM 1984b. Bureau of Land Management. 1984. Manual 8410-1 - Visual Resource Inventory. Accessed at: http://www.blm.gov/nstc/VRM/8410.html.

BLM 1984c. Bureau of Land Management. 1984. Manual 8431 - Visual Resource Contrast Rating. Accessed at: http://www.blm.gov/nstc/VRM/8431.html.

BLM and NMDGF 2011. Bureau of Land Management and New Mexico Department of Game and Fish. 2011. Memorandum of Understanding between U.S. Department of the Interior-Bureau of Land Management, Las Cruces District Office and New Mexico Department of Game and Fish Concerning Relationship as a Cooperating Agency for the Copper Flat Mine Environmental Impact Statement. 6 pp.

BLS 2014. U.S. Bureau of Labor Statistics. 2014. National Census of Fatal Occupational Injuries in 2013 (Preliminary Results). Accessed October 2014 at http://www.bls.gov/news.release/pdf/cfoi.pdf.

BLS 2010. U.S. Bureau of Labor Statistics. 2010. Labor force data by county, 2000-2010 annual averages. Accessed July 30, 2012 at: http://www.bls.gov/lau/#data.

BLS 2000. U.S. Bureau of Labor Statistics. 2000. Labor force data by county, 2000 annual averages. Accessed July 30, 2012 at http://www.bls.gov/lau/#data.

Bohannan 2012. Bohannan Huston, Inc. study “Copper Flat Traffic Analysis” dated 28 August 2012.

Bohlen, A. 2002. Regulating the Unknown, Pit Lake Policies State by State, Southwest Hydrology. September/October.

Bokich 2012. Bokich, J. Vice President, Duran Bokich Enterprises, LLC. (Personal Communication) MSHA Training. January 30 to February 1, 2012.

Brodeur, P. 2003. Combating Alcohol Abuse in Northwestern New Mexico: Gallup’s Fighting Back and Healthy Nations Programs. Robert Wood Johnson Foundation. Accessed February 2012 at www.rwjf.org/files/research/anthology2003chapter7.pdf.

Brousseau, R. and Yen, I. 2000. Reflections: On the Connections Between Work and Health. Accessed June 2012 at http://www.calwellness.org/assets/docs/reflections/jun2000.pdf.

Brown et al. undated. Brown, P.E.; Altenbach, J.S.; and Sherwin, R.E. Undated. Evicting Bats When Gates Won’t Work: Unstable Mines and Renewed Mining. Dept. Physiol. Sciences, UCLA, 134 Eagle Vista, Bishop, CA 93514 (PEB); Dept. of Biology, Univ. of NM, Albuquerque, NM 87131.

Bush, K. and Medd, L.M. 2005. Population health and oil and gas activities: A preliminary assessment of the situation in northeastern BC. Accessed November 2011 at: prrd.bc.ca/board/meetings/agenda/documents/rd/cfour011008.pdf.

Caltrans no date. California Department of Transportation. No date. Draft Visual Impact Assessment Template. Accessed 05/14/2011 online at http://www.dot.ca.gov/ser/vol1/sec6/ch37joint/Visual%20Boilerplate.pdf.

Caltrans and FHWA. 2015. California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA). San Diego Freeway (I-405) Improvement Project Final Environmental Impact Report/Environmental Impact Statement. Accessed April 2015 at http://www.dot.ca.gov/dist12/DEA/405/index.php#DEIS

Caltrans 2004. California Department of Transportation. 2004. Transportation- and Construction-Induced Ground Vibration Guidance Manual. Sacramento, CA.

Caltrans 1997. Caltrans Environmental Program. 1997. Community Impact Assessment. Accessed September 2012 at http://www.dot.ca.gov/ser/vol4/envhb4.pdf.

Capps 2014. Sierra Electric Cooperative. (Personal Communication) J. Capps of Habitat Management, Inc. April 1, 2014.

Castedenyk, D.N.; Eary, L.E. 2009. The Nature and Global Distribution of Pit Lakes, in Castedenyk, D.N., Eary, L.E, editors, Mine Pit Lakes, Characteristics, Predictive Modeling, and Sustainability, Society of Mining, Metallurgy and Exploration, Littleton, Colorado.

CDM Smith, Inc. 2013. Memorandum - Review of Proposed Mineral Processing Operations and Assessment of Reduced Water Use Alternatives for Tailings Disposal. 11 March 3013. 25 pp.

CEQ 2007. Council on Environmental Quality. 2007. A Citizen’s Guide to the NEPA: Having Your Voice Heard. http://ceq.hss.doe.gov/nepa/Citizens_Guide_Dec07.pdf. Accessed February 2013.

CEQ 1998. Council on Environmental Quality. 1998. Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses. Accessed March 3, 2011 at http://www.epa.gov/environmentaljustice/resources/policy/ej_guidance_nepa_epa0498.pdf.

CEQ 1997. Council on Environmental Quality. 1997. Environmental Justice, Guidance under the National Environmental Policy Act. Accessed March 3, 2011 at http://ceq.hss.doe.gov/nepa/regs/ej/justice.pdf.

Cox et al. 2004. Cox, T.; Leka, S.; Ivanov, I.; and Kortum, E. 2004. Work, employment and mental health in Europe. Work & Stress 18(2): 179–185.

Davie and Spiegel 1967. Davie, W., Jr. and Spiegel, Z. 1967. Las Animas Creek hydrographic survey report, Geology and water resources of Las Animas Creek and vicinity, Sierra County, New Mexico. New Mexico State Engineer’s Office, Santa Fe, New Mexico. 34 p.

Dick-Peddie, W.A. 1999, New Mexico Vegetation: past, present, and future: Albuquerque, N. Mex., University of New Mexico Press, 280 pp.

Didham, R. 2010. Ecological Consequeneces of Habitat Fragmentation. eLS. Accessed online at http://onlinelibrary.wiley.com/doi/10.1002/9780470015902.a0021904/references

Dowling, J.; Atkin, S.; Beale, G.; and Alexander, G. 2004. Development of the Sleeper Pit Lake, Mine Water and the Environment, 23:2-11, Springer-Verlag.

Dunn, P. G. 1982. Geology of the Copper Flat Porphyry Copper Deposit, Hillsboro, Sierra County, New Mexico. In Titley (editor), Advances in the Geology of Porphyry Copper Deposits, University of Arizona Press. pp. 313-325

Eary, L.E. and Schafer, W.M. 2009. Approaches for Evaluating the Predictive Reliability of Pit Lake Numerical Models, in Castedenyk, D.N., Eary, L.E, editors, Mine Pit Lakes, Characteristics, Predictive Modeling, and Sustainability, Society of Mining, Metallurgy and Exploration, Littleton, Colorado.

Emmer 2015. New Mexico Copper Corporation. 27 April, 2015. Personal email communication with Katie Emmer, Project Manager.

EMNRD 2015. Energy, Minerals and Natural Resources Department. 2015. Annual Visitation/Revenue for State Parks in Sierra County, NM. January 27, 2015.

EMNRD 2012. Energy, Minerals and Natural Resources Department. 2012 Annual Report. Accessed February 2015 at http://www.emnrd.state.nm.us/ADMIN/documents/EMNRD-2012-Annual-Report.pdf

EMNRD 2005. Energy, Minerals and Natural Resources Department. 2005 Annual Report. Accessed February 2015 at http://www.emnrd.state.nm.us/ADMIN/documents/2005AnnualReport.pdf

ESRI 2010. Environmental Systems Research Institute. 2010. ESRI Data & Maps. Redlands, CA.

FAA 2008. Federal Aviation Administration. 2008. Final Environmental Impact Statement for the Spaceport America Commercial Launch Site. Sierra County, New Mexico: Office of Commercial Space Transportation.

FBI 2010. Federal Bureau of Investigation. 2010. New Mexico – Full-time Law Enforcement Employees by Metropolitan and Nonmetropolitan Counties, 2010. Accessed September 13, 2014 at http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2010/crime-in-the-u.s.-2010/tables/table-80/10tbl80nm.xls.

FDOT 2000. Florida Department of Transportation. 2000. Community Impact Assessment: A Handbook for Transportation Professionals. Accessed September 2012 at http://www.dot.state.fl.us/research-center/Completed_Proj/Summary_EMO/FDOT_BB296_rpt.pdf.

FDOT 1998. Florida Department of Transportation, Systems Planning Office. 1998. "Level of Service Handbook."

FHWA 2014. Federal Highway Administration. 2014. Construction Noise Handbook 9.0. Construction Equipment Noise Levels and Ranges. Accessed March 2014 at http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm.

FEMA 2015. Federal Emergency Management Agency. Sierra County CERT Team. Accessed February 2015 at http://www.citizencorps.fema.gov/cc/showCert.do?id=43266&cert.

FEMA 2014. Federal Emergency Management Agency. Community Emergency Response Teams. July 24, 2014. Accessed January 15, 2015 at https://www.fema.gov/community-emergency-response-teams.

FEMA 2012. Federal Emergency Management Agency. Sierra County CERT Team. October 15, 2012. Accessed January 15, 2015 at http://www.citizencorps.fema.gov/cc/showCert.do?id=43266&cert.

Fenneman, N.M. and Johnson, D.W. 1946. Physiographic divisions of the conterminous United States. Accessed online at http://water.usgs.gov/GIS/metadata/usgswrd/XML/physio.xml.

Firefly Forest 2015. The Firefly Forest. 2015. Arizona Sycamore. Accessed online August 2014 at: http://fireflyforest.net/firefly/2005/05/21/arizona-sycamore/.

GAO 2009. Government Accountability Office. 2009. Hardrock Mining: Information on State Royalties and the Number of Abandoned Mine Sites and Hazards. Accessed September 13, 2014 at http://www.gao.gov/assets/130/123013.pdf.

Gallagher, L.M. 1995. Clean Water Act, in Sullivan, T.F.P., editor, Environmental Law Handbook, Thirteenth Edition, Government Institutes, Inc., Rockville, Maryland.

Gentry, S. 2014. Bureau of Land Management, Las Cruces District Office. 3 October, 2014. Email communication with Shannon Gentry, Rangeland Management Specialist.

Geller, W. and Schultze, M. 2013. Remediation and Management of Acidified Pit Lakes and Outflowing Waters, in Geller, W., Schultze, M., Kleinman, R., Wolkersdorfer, C. editors, Acidic Pit Lakes, The Legacy of Coal and Metal Surface Mines, Springer, Heidelberg.

Goldenberg et al. 2010. Goldenberg, S.M.; Shoveller, J.A.; Koehoorn, M.; and Ostry, A.S. 2010. And they call this progress? Consequences for young people of living and working in resource-extraction communities. Critical Public Health. 20 (2): 157–168.

GPK 2014. GPK Media, Sierra Sentinel. 2014. Is it Big Enough? January 23, 2014. Accessed September 13, 2014 at http://gpkmedia.com/are-local-schools-big-enough/.

Gustin 2014. Sierra County Road Department. (Personal Communication) Mr. Nathan Gustin, Road Superintendent, 29 September 2014.

Hand et al. 2008. Hand, M. S.; Thatcher, J.A.; McCollum, D.W.; and Berrens, D.W. Intra-regional amenities, wages, and home prices: The role of forests in the Southwest. Land Economics 84(4):635–651.

Harris, C.M. 1998. Handbook of Acoustical Measurement and Noise Control. Acoustical Society of America. Sewickley, PA.

Hartman, E. PhD. No date provided. A Literature Review on the Relationship between Employment and Health: How this Relationship May Influence Managed Long Term Care. Accessed June 2012 at http://www.dhs.wisconsin.gov/wipathways/ResearchDocs/litrevw.pdf.

HCS 1995. University of Florida. 1995. Highway Capacity Software (HCS), Release 2.1f.

HDA 2004. Health Development Agency (HDA). 2004. The evidence about work and health. Accessed September 13, 2014 at http://www.nice.org.uk/nicemedia/documents/CHB18-work_health-14-7.pdf.

Hewitt, R. 2012. Bureau of Land Management. GIS Office. Personal Communication. GIS Data. June 18, 2012.

HighPlan 2012. Highway Level of Service Analysis Software, Florida Department of Transportation, Based upon 2010 Highway Capacity Manual, version 12/12/2012.

HRSA 2014. Health Resources and Services Administration, U.S. Department of Health and Human Services. Find Shortage Areas: HPSA by State & County. Accessed September 13, 2014 at http://hpsafind.hrsa.gov/HPSASearch.aspx

ICMM 2005. International Council on Mining & Metals. 2005. Financial Assurance for Mine Closure and Reclamation. Accessed September 13, 2014 http://www.icmm.com/document/282.

ICMM 2006. International Council on Mining & Metals. 2006. Guidance Paper: Financial Assurance for Mine Closure and Reclamation. Accessed September 13, 2014 at http://www.icmm.com/page/1232/guidance-paper-financial-assurance-for-mine-closure-and-reclamation.

IMPLAN 2014. IMPLAN Group LLC. 2014. IMPLAN Tax Impact Calculations. Accessed September 13, 2014 at http://implan.com/index.php?option=com_content&view=category&id=339.

INTERA 2012. Baseline characterization data report for Copper Flat Mine Sierra County, New Mexico. Prepared for New Mexico Copper Corporation. Submitted to Mining and Minerals Division of New Mexico Energy, Minerals and Natural Resources Department. February 2012.

International Network on Acid Prevention, Global Acid Rock Drainage Guide. 2014. http://www.gardguide.com/index.php?title=Chapter_6#6.6.6_Engineered_Barriers, accessed October 6, 2014.

ISO 1989. International Organization for Standardization. 1989. The ISO 9613 standard: Acoustics -- Attenuation of sound during propagation outdoors was used in the assessment.

ITE 1999. Institution of Transportation Engineers. 1999. "Transportation Planning Handbook."

Jin et al. 1995. Jin, R.L.; Shah, C.P.; and Svoboda, T.J. 1995. The Impact of Unemployment on Health: A Review of the Evidence. Canadian Medical Association Journal. 153(5): 529-540.

JSAI 2015. John Shomaker & Associates. 2015. Technical Memorandum, Subject: Model Projections – Operating Scenarios Considered for Copper Flat EIS, August 11, 2015. 18pp.

JSAI 2014. John Shomaker and Associates Inc. 2014. Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico. Prepared for the New Mexico Copper Corporation.

JSAI 2014a. John Shomaker and Associates Inc. 2014. E-mail from Mike Jones to Lee Wilson regarding RE: PDEIS model, transmitting EIS Alt 2 modeling results. August 1, 2014.

JSAI 2014b. John Shomaker and Associates Inc. 2014. E-mail from Mike Jones to Katie Emmer, Dave Henney, Lee Wilson, and others regarding RE: Copper Flat EIS, transmitting EIS Alt 0 and EIS Alt 1 modeling results. August 15, 2014.

JSAI 2013a. John Shomaker and Associates Inc. 2013. Status Report for Stage 1 Abatement Plan at the Copper Flat Mine Site Near Hillsboro, New Mexico.

JSAI 2013b. John Shomaker and Associates Inc. 2013. Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico.

JSAI 2013c. John Shomaker and Associates Inc. 2013. Model Projections – Operating Scenarios Considered for Copper Flat EIS, Technical Memorandum.

JSAI 2012. John Shomaker and Associates Inc. 2012. Conceptual Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico.

JSAI 2012a. John Shomaker and Associates Inc. 2012. Hydrogeologic analysis of proposed pumping test for New Mexico Copper Corporation supply wells (LRG-4652, LRG-4652-S, LRG-4652-S-2, and LRG-4652-S-3). Prepared for New Mexico Copper Corporation. May 18, 2012.

Jones, M.A., Shomaker, J.W., Finch Jr., S. 2013. Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico. Prepared for New Mexico Copper Corporation. August 22, 2013.

Jones, M.A., Shomaker, J.W., Finch Jr., S. 2012. Conceptual Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico. Prepared for New Mexico Copper Corporation.

Kalin, M.and Wheeler, W.N. 2013. Biological Polishing of Arsenic, Nickel, and Zinc in an Acidic Lake and Two Alkaline Pit Lakes, in Geller, W., Schultze, M., Kleinman, R., Wolkersdorfer, C. editors, Acidic Pit Lakes, The Legacy of Coal and Metal Surface Mines, Springer, Heidelberg.

K, S.; Johnson, P.; Lucas, S.; McLemore, V.; and Koning, D. 2013. Structural Control of Warm Springs in the Hillsboro-Lake Valley Area. Prepared for the New Mexico Geological Society Annual Spring Meeting.

Kempton, J.H.; Locke, W.; Atkins, D.; and Nicholson, A. 2000. Probabilistic Quantification of Uncertainty in Predicting Mine Pit-Lake Water Quality, Mining Engineering, October 2000.

Kempton, H. and Atkins, D. 2000. Delayed Environmental Impacts from Mining in Semi-Arid Environments, Proceeding of the Fifth International Conference on Acid Rock Drainage, Society for Mining Metallurgy and Exploration, Littleton, Colorado.

Kuipers, J.R.; Maest, A.S.; MacHardy, K.A.; and Lawson, G. 2006. Comparison of Predicted and Actual Water Quality at Hardrock Mines: The Reliability of Predictions in Environmental Impact Statements.

Las Cruces Sun-News, 2008. Las Cruces Sub News, Jose Medina. Sierra County votes ‘Yes’: Tax to fund spaceport passes in record vote. April 23, 2008. Accessed January 15, 2015 at http://www.lcsun-news.com/ci_9020465.

Lines, G.C. 1999. Health of Native Riparian Vegetation and its Relation to Hydrologic Conditions Along the Mojave River, Southern California. U.S. Geological Survey Water Resources Investigations Report 99-4112. Available online at: http://www.mojavewater.org/files/HealthofNativeRiparianVegetationandItsRelationtoHydrologicConditionsAlongMojaveRiver.pdf.

Long, A. 2011. “Financial Education as a Means of Reducing Proverty.” Proverty 423: Capstone. Lexington, Virginia: Washington and Lee University.

LRPA 2014. Memorandum regarding Water resources for Copper Flat Mine. June 3, 2014.

M3 2012. M3 Engineering and Technology Corporation. 2012. Copper Flat Project. Form 43-101F1 Technical Report. Prefeasibility Study. August 2012.

M3 2013. M3 Engineering and Technology Corporation. 2013. Copper Flat Project. Form 43-101F1 Technical Report. Prefeasibility Study. November 2013.

M3 2013a. M3 Engineering and Technology Corporation. 2013. (Personal communication) Richard Zimmerman, Peter Olzewski, and Jeffrey Smith. April 2013.

Maest, A.; Kuipers, J.; MacHardy, K.; and Lawson, G. 2006. Predicted Versus Actual Water Quality at Hardrock Mine Sites: Effect of Inherent Geochemical and Hydrologic Characteristics, 7th International Conference on Acid Mine Drainage, American Society of Mining and Reclamation, Lexington, KY.

Marsh, W. M. 2005. Landscape Planning Environmental Applications. Fourth Edition. New Jersey: John Wiley & Sons, Inc.

Marvier et al. 2004. Marvier, M.; Kareiva, P.; and Neubert, M.G. 2004. Habitat destruction, fragmentation, and disturbance promote invasion by habitat generalists in a multispecies metapopulation. Risk Analysis 24(4):869-878.

Mattson, H. and Okun, A. 2011. Cultural Resource Survey for Pipeline and Aquifer Testing, Copper Flat Mine, Sierra County, New Mexico. Prepared by Parametrix, Albuquerque, New Mexico. October 2011.

McLemore, V. T. 2001. Geology and evolution of the Copper Flat porphyry system, Sierra County, New Mexico. Downloaded from http://geoinfo.nmt.edu/staff/mclemore/projects/mineralresources/hillsboro.html

Milkman et al. 1980. Milkman, R. H.; Hunt, L.G.; Pease, W.; Perez, U.M.; Crowley, L.J.; and Boyd, B. 1980. Drug and Alcohol Abuse in Booming and Depressed Communities. Accessed September 13, 2014 at: http://www.ncjrs.gov/App/Publications/abstract.aspx?ID=67019.

Miller, G. T. 2003. Environmental Science. 9th edition. Brooks/Cole-Thomson Learning: Pacific Grove, California.

MMD no date. Mining and Minerals Division. No date provided. Mining and Minerals Division. Accessed February 2013 at http://www.emnrd.state.nm.us/mmd/.

Montoya, J. 2012. Bureau of Land Management. NEPA Manager. (Personal Communication.) BLM Special Management Areas. May 2012.

MSHA 2014a. Mine Safety and Health Administration. 2014. Mine All-Injury Rate, Metal/Non Metal Mines, CY 2007 – CY 2013. Accessed October 2014 at http://www.msha.gov/MSHAINFO/FactSheets/MSHAbytheNumbers/CalendarYear/All-Injury%20Rates.pdf.

MSHA 2014b. Mine Safety and Health Administration. 2014. Mine Fact Sheet: Mine Fatality Rate, Metal/Non Metal Mines, CY 2007 – CY 2013. Accessed October 2014 at http://www.msha.gov/MSHAINFO/FactSheets/MSHAbytheNumbers/CalendarYear/Fatality%20Rates.pdf.

Munshower, F.F. 1994. Practical Handbook of Disturbed Land Reclamation, Lewis Publishers.

NAS 1999. National Academy of Sciences. 1999. National Research Council, Evaluation of Guidelines for the Exposures to Technologically Enhanced Naturally Occurring Radioactive Materials, National Academy Press. January.

National Research Council (NRC). 1999. Hard Rock Mining on Federal Lands, National Academy Press, Washington D.C.

NCES 2011. U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD). 2010-2011. Public Elementary/Secondary School Universe Survey. Accessed September 13, 2014 at http://nces.ed.gov/ccd/elsi/

Newcomer, R.W.; Shomaker, R.W.; and Finch, S.T. 1993. Hydrologic assessment, Copper Flat Project, Sierra County, New Mexico. Prepared by John Shomaker & Associates, Inc. for Gold Express Corporation. May 1993.

NIOSH 2011. National Institute for Occupational Safety and Health. 2011. NIOSH Pocket Guide to Chemical Hazards: Molybdenum. Accessed June 2012 at http://www.cdc.gov/niosh/npg/npgd0433.html.

NIOSH 2008. National Institute for Occupational Safety and Health. 2008. NIOSH International Chemical Safety Cards: Sodium Hydrogensulfide. Accessed June 2012 at http://www.cdc.gov/niosh/ipcsneng/neng1710.html.

NIOSH 2006. National Institute for Occupational Safety and Health. 2006. NIOSH International Chemical Safety Cards: Molybdenum. Accessed June 2012 at http://www.cdc.gov/niosh/ipcsneng/neng1003.html.

NIOSH 1997. National Institute for Occupational Safety and Health. 1997. NIOSH International Chemical Safety Cards: Calcium Hydroxide. Accessed June 2012 at http://www.cdc.gov/niosh/ipcsneng/neng0408.html.

NJDHSS 2011. New Jersey Department of Health and Senior Services. 2011. Right to Know – Hazardous Substance Fact Sheet: Ammonium Sulfide. Accessed June 2012 at http://nj.gov/health/eoh/rtkweb/documents/fs/0115.pdf.

NMACP 2014. New Mexico Avian Conservation Partners. 2014. Sprague's Pipit (Anthus spragueii). Available online at: http://www.nmpartnersinflight.org/spraguespipit.html. Accessed October 2014.

NMCC 2015. New Mexico Copper Corporation. 2015. (Personal communication) From K. Emmer, Subject: Figure as a jpeg. 24 April 2015.

NMCC 2015a. New Mexico Copper Corporation, THEMAC Resources. Jeffrey Smith, P.E. – Chief Operating Officer. 2015. (Personal Communication) Royalties. January 15, 2015.

NMCC 2015b. New Mexico Copper Corporation. (Personal Communication) Subject: Response to questions re: groundwater results. February 24, 2015.

NMCC 2015c. New Mexico Copper Corporation. (Memo) Subject: Conceptual Pit Reclamation Plans for Copper Flat. June 26, 2015.

NMCC 2015d. New Mexico Copper Corporation. 2015. Biological Resources Survey, Copper Flat Mine: Nine Millsites and Two Substation Alternatives. 12 May 2015.

NMCC 2014. New Mexico Copper Corporation. 2014. Revised Copper Flat Mine Water Balance and Water Conservation Plans. 23 January 2014. 9 pp.

NMCC 2013. New Mexico Copper Corporation. 2013. Copper Flat Mine, Alternative 2 – Summary Plan of Operations. 10 October 2013. 43 pp.

NMCC 2012. New Mexico Copper Corporation. 2012. (Personal Communication) Responses to Solv data requests in Data Validation Report. August 7, 2012.

NMCC 2012a. New Mexico Copper Corporation. 2012. Copper Flat Scoping Study: 17,500 Tons per Day Plan. March 2012. 172 pp.

NMCC 2012b. New Mexico Copper Corporation. 2012. Copper Flat Project: Form 43-101F1 Technical Report Prefeasibility Study. 22 August 2012. 271 pp.

NMCC 2012c. New Mexico Copper Corporation. 2012. Mine Operation and Reclamation Plan. 18 July 2011. 89 pp.

NMCC 2012d. New Mexico Copper Corporation. 2012. Tailings Disposition Trade-off Study, Rev 0. 27 November 2012. 371 pp.

NMDA 2012. New Mexico Department of Agriculture. 2012. Noxious Weed Information. Available online at http://www.nmda.nmsu.edu/apr/noxious-weed-information/.

NMDA 2005. New Mexico Department of Agriculture. 2005. Non-native Phreatophyte/Watershed Management Plan. A joint effort by the House Bill 2 Interagency Workgroup, prepared by the Tamarisk Coalition. Available online at http://www.nmda.nmsu.edu/wp-content/uploads/2012/06/2005_nmnpwmp.pdf. August 2.

NMDGF Undated. New Mexico Department of Game and Fish. Caballo Reservoir and Caballo Lake State Park, watchable wildlife site 53. <http://www.wildlife.state.nm.us/publications/documents/caballo_reservoir.pdf>.

NMFGD 2015. New Mexico Fish and Game Department. 2015. Sport Fish Restoration Act. Accessed February 2015 at http://www.wildlife.state.nm.us/fishing/game-fish/.

NMDGF 2012. New Mexico Department of Game and Fish. 2012. New Mexico Off-Highway Vehicle Program. Accessed June 2012 at http://www.wildlife.state.nm.us/ohv/ohv.html.

NMDGF 2012a. New Mexico Department of Game and Fish. 2012. Strategic Plan – New Mexico Department of Game and Fish, FY 2013 through FY 2018. Accessed February 2013 at http://www.wildlife.state.nm.us/documents/2013-2018+Strategic+Plan.pdf.

NMDOT 2014. New Mexico Department of Transportation "TIMS Road Segments by Posted Route" 27. March 2014.

NMDOT 2001. New Mexico Department of Transportation "New Mexico Access Management Manual." 1 October 2001

NMDWS 2010. New Mexico Department of Workforce Solutions. 2010. Major Employers in Sierra County. Accessed September 13, 2013.

NMED 2014. New Mexico Environment Department. 2014. New Mexico Copper Corporation. Universal Air Quality Permit Application for the Copper Flat Mine. Accessed March 2014 at http://www.nmenv.state.nm.us/aqb/permit/documents/ Permit_Application_Copper_Flat_Mine_0365M3_11Mar13.pdf.

NMED 2014a. New Mexico Environment Department Surface Water Quality Bureau (SWQB). 2014. NPDES permits in New Mexico. <http://www.nmenv.state.nm.us/swqb/Permits/>.

NMED 2012a. New Mexico Environment Department. 2012. NMED About Us. Accessed February 2013 at http://www.nmenv.state.nm.us/NMED/aboutus.htm.

NMED 2012b. New Mexico Environment Department. 2012. Ground Water Quality Bureau: Mining Environmental Compliance Section. Accessed February 2013 at http://www.nmenv.state.nm.us/gwb/NMED-GWQB-MiningEnvironmentalComplianceSe.htm.

NMEMNRD 2010. New Mexico Energy, Minerals and Natural Resources Department. 2010. Guidance Document for Part 6 New Mining Operation Permitting Under the New Mexico Mining Act. Accessed February 2013 at http://www.emnrd.state.nm.us/MMD/MARP/Documents/Part_6_Guidelines-August2010.pdf.

NMEMNRD no date(a). New Mexico Energy, Minerals and Natural Resources Department. No date provided. About. Accessed February 2013 at http://www.emnrd.state.nm.us/ADMIN/about.html.

NMEMNRD no date(b). New Mexico Energy, Minerals and Natural Resources Department. No date provided. Organizational Chart. Accessed February 2013 at http://www.emnrd.state.nm.us/documents/EMNRD-org-chart.pdf.

New Mexico Compilation Commission. No date provided. New Mexico Compilation Commission – New Mexico Statutes Annotated (Unannotated): Chapter 69 Mines Article 27. Accessed November 2012 at http://public.nmcompcomm.us/nmpublic/gateway.dll/?f=templates&fn=default.htm.

NMOSE 2014. New Mexico Office of the State Engineer. 2014. WATERS database. Available at <http://www.ose.state.nm.us/waters_db_index.html>.

NMPSFA 2012. New Mexico Public School Facilities Authority. 2012. Fiscal Year 2012 Annual Report. Accessed September 13, 2014 at: http://www.nmpsfa.org/pdf/Annual/AR12.pdf.

NMTRD 2010a. New Mexico Taxation and Revenue Department. 2010. 2009 Property Tax Facts. Accessed July 12, 2012 at http://www.tax.newmexico.gov/SiteCollectionDocuments/Tax-Library/Economic-and-Statistical-Information/Property-Taxes/09%20Property%20Tax%20Facts%207_29_2010.pdf.

NMTRD 2010b. New Mexico Taxation and Revenue Department. 2010. Monthly RP-80 Reports: Gross Receipts by Geographic Area and 6-digit NAICS Code. Accessed January 15, 2015 at:

http://www.tax.newmexico.gov/monthly-rp-80-reports-gross-receipts-by-geographic-area-and-6-digit-naics-code.aspx .

NMTRD 2012a. New Mexico Taxation and Revenue Department. 2012. All Taxes (Severance Taxes). Accessed July 15, 2012 at http://www.tax.newmexico.gov/All-Taxes/Pages/Home.aspx.

NMTRD 2012b. New Mexico Taxation and Revenue Department. 2012. 2012 New Mexico Tax Expenditure Report. Accessed October 30, 2012 at http://www.tax.newmexico.gov/SiteCollectionDocuments/2012%20Tax%20Expend%20Report%20Final.pdf.

NOAA 2014. National Oceanic and Atmospheric Administration. 2014. Point precipitation frequency estimates for New Mexico. Accessed September 2014 at <http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=nm>.

NOAA 1999. National Oceanic and Atmospheric Administration. 1999. Cameo Chemicals: Ammonium Sulfide. Accessed June 2012 at http://cameochemicals.noaa.gov/chris/ASF.pdf.

NPS 2012. National Park Service. 2012. Trees and Shrubs. Available online at http://www.nps.gov/moca/naturescience/trees-and-shrubs.htm.

NPS 2009. National Park Service. 2009. Gila Cliff Dwellings National Monument. Accessed May 2012 at http://www.nps.gov/gicl/index.htm.

NPS 1990. National Park Service. 1990. How to Apply the National Register Criteria for Evaluation. National Register Bulletin 15. U.S. Department of the Interior, National Park Service, Cultural Resources, Washington, D.C. Revised 1997.

NRCS 2014. United States Department of Agriculture, Natural Resources Conservation Service. 2014. Ecological Site Description: Hills. Available online at: https://esis.sc.egov.usda.gov/ESDReport/fsReport.aspx?id=R035XG124NM&rptLevel=all&approved=yes&repType=regular&scrns=&comm=

NRCS 1984. Natural Resource Conservation Service. 1984. Soil Survey of Sierra County, New Mexico. Available online at http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/new_mexico/NM660/0/Sierra.pdf

NZME 2001. New Zealand Ministry for the Environment. 2001. Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions. Available online at: http://www.mfe.govt.nz

Okun et. al 2013. Okun, A.; Mattson, M.; Shine, T.; and Beacham, B. 2013. Cultural Resource Inventory of the Copper Flat Mine Permit Area, Sierra County, New Mexico. Prepared by Parametrix, Albuquerque, New Mexico. February 2013.

OSE 2014. New Mexico Office of the State Engineer. Email from Kevin Myers to Dave Henney (cc: Doug Haywood, Bureau of Land Management), re: Water rights at Copper Flat. January 16, 2014.

OSE 2006. New Mexico Office of the State Engineer. 2006. Rules and Regulations Governing the Appropriation and Use of Ground Water in New Mexico. Accessed February 2013 at http://www.ose.state.nm.us/PDF/RulesRegsGuidelines/GroundWaterRulesRegs-2005-08-15.pdf.

OSE 2005. Office of the State Engineer. 2005. New Mexico Office of the State Engineer. Accessed February 2013 at http://www.ose.state.nm.us/.

OTAK. 2010. Visual Resources Inventory. Prepared for the U.S. Department of the Interior Bureau of Land Management Las Cruces District Office, Las Cruces, New Mexico

Parametrix. 2011. Biological Resources Survey Report, Copper Flat Pipeline and Well Sites, Sierra County, New Mexico. Prepared by Parametrix, Albuquerque, New Mexico.

Park, B.T.; Wangerud, K.W.; Fundingsland, S.D.; Adzic, M.E.; and Lewis, M.N. 2006. In Situ Chemical and Biological Treatment Leading to Successful Water Discharge from Anchor Hill Pit Lake, Gilt Edge Mine Superfund Site, South Dakota, USA, in Barnhisel editor, Proceedings of 7th International Conference on Acid Rock Drainage, American Society of Mining and Reclamation, Lexington, KY.

Parker and King 1998. Parker, P. L. and King, T.F. 1998. Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Register Bulletin 38. National Park Service, U.S. Department of the Interior. Washington, D.C.

Pathways Consulting Service. 2008. Geronimo Trail National Scenic Byway Corridor Management Plan. Accessed May 2012 at http://www.geronimotrail.com/cmp/cmp2008.pdf

Pelletier, C.A.; Wen, M.E.; and Poling, G.W. 2009. Flooding of Pit Lakes with Surface Water, in Castedenyk, D.N., Eary, L.E, editors, Mine Pit Lakes, Characteristics, Predictive Modeling, and Sustainability, Society of Mining, Metallurgy and Exploration, Littleton, Colorado.

SA 2014. Spaceport America, 2014. Spaceport America Newsletter – May 2014. Accessed February 2015 at http://spaceportamerica.com/newsletters/spaceport-america-newsletter-may-2014/

Sanchez, J. 2012. Bureau of Land Management. (Personal Communication) Recreation. May 23, 2012.

Seager, W.R., Shafiqullah, M., Hawley, J.W., and Marvin, R.F. 1984. New K-Ar dates from basalts and the evolution of the southern Rio Grande rift. Geological Society of America Bulletin, No. 1, pages 87-99.

Seager, W.R., Clemmons, R.E., Hawley, J.W., and Kelley, R.E. 1982. Geology of northwest part of Las Cruces 1° x 2° sheet, New Mexico. Geologic map 53, New Mexico Bureau of Mines & Mineral Resources.

SCBC 2006. Sierra County Board of Commissioners. 2006. Sierra County Comprehensive Plan. January 2006. Accessed October 2012 at http://www.jkagroup.com/Docs/clients/sierracounty.pdf.

Seydlitz, R. and Laska, R. 1994. Social and economic impacts of petroleum “boom and bust” cycles. A final report by the Louisiana Universities Marine Consortium for the U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. Accessed September 13, 2014 at www.data.boem.gov/PI/PDFImages/ESPIS/3/3442.pdf.

SHB 1980. Geotechnical and Design Development Report. Tailings Dam and Disposal Area, Quintana Minerals Corporation, Copper Flat Project; Golddust, New Mexico. Technical Report for Quintana Minerals.

Shevnell, L.; Connors, K.A.; and Henery, C.D. 1999. Controls on Pit Lake Water quality at Sixteen Open-Pit Mines in Nevada, Applied Geochemistry, 14 (1999) 669-687.

Sierra County 2014. Sierra County Government Website (http://www.sierracountynm.gov/post/205945-landfill-closing). Accessed June 2014.

Sierra County 2012. Sierra County Tourism. 2012. Welcome to Sierra County Oasis of the Southwest. Accessed June 2012 at http://www.sierracountynewmexico.info/.

Sierra County. 2006. Sierra County Comprehensive Plan. Accessed February 2012 at http://www.jkagroup.com/Docs/clients/sierracounty.pdf.

Siskind, D.E. 1989. "Vibrations and Airblast Impacts on Structures from Munitions Disposal Blasts," Proceedings, Inter-Noise 89. G.C. Maling, Jr., editor, pages 573 - 576.

Spaceport America 2015. (Personal Communication) Employment at Spaceport America. Chief Executive Officer - Christine Anderson. June 5, 2015

SRK Consulting 2014. Humidity Cell Termination Report for the Copper Flat Project, New Mexico. February 2014.

SRK Consulting 2013a. Predictive Geochemical Modeling of Pit Lake Water Quality at the Copper Flat Project, New Mexico. September 2013.

SRK Consulting 2013b. Geochemical Characterization Report for the Copper Flat Project, New Mexico. May 2013.

SRK Consulting 1995. Copper Flat Mine, Copper Flat Mine Hydrogeologic Studies. Steffen Robertson and Kirsten, Inc. Copper Flat, New Mexico. 1995.

Stephens, Daniel B. & Associates, Inc. 1998. Environmental Evaluation Report, Copper Flat Project. Prepared for New Mexico Energy, Minerals and Natural Resources Department Mining and Minerals Division, Santa Fe, New Mexico.

SVH 2014. Sierra Vista Hospital. 2014. About Us. Accessed September 13, 2014 at http://www.svhnm.org/health-care-about-us.

SVH 2012. Sierra Vista Hospital.2012. About Us. Accessed August 2012 at: http://svhnm.org/html/about.html.

TCVFD 2014. Truth or Consequences Volunteer Fire Department. 2014. Personal Communication – Volunteer Fire Stations and Firefighters in Sierra County. October 27, 2014.

TEEIC 2013a. Tribal Energy and Environmental Information Clearinghouse. Environmental Justice Mitigation Measures. Accessed September 13, 2014 at http://teeic.anl.gov/er/coal/mitigation/justice/index.cfm.

TEEIC 2013b. Tribal Energy and Environmental Information Clearinghouse. Socioeconomic Mitigation Measures. Accessed September 13, 2013 at http://teeic.anl.gov/er/coal/mitigation/socio/index.cfm.

THEMAC 2014. THEMAC Resources - New Mexico Copper Corporation. 2014. Katie Emmer, Permitting & Environmental Compliance Manager. (Personal Communication) Copper Flat Final Model EIS Cases. April 24, 2014.

THEMAC 2014a. THEMAC Resources - New Mexico Copper Corporation. Jeffrey Smith, P.E. – Chief Operating Officer. 2014. (Personal Communication) Workforce question. May 2, 2014.

THEMAC 2014b. THEMAC Resources - New Mexico Copper Corporation. Katie Emmer, Permitting & Environmental Compliance Manager. (Personal Communication) Sierra County Cost RFI. November 20, 2014.

THEMAC 2013. THEMAC Resources – New Mexico Copper Corporation. Copper Flat Mine Alternative 2 -- Summary Plan of Operations. October 10, 2013.

THEMAC 2013a. THEMAC Resources. (Technical Memorandum) Corrections to MPO for Copper Flat, December 2010 and Revision June 2011, Corrections to subsequent mine plans and new information. December 16, 2013.

THEMAC 2013b. THEMAC Resources - New Mexico Copper Corporation. 2013. Copper Flat Project. Form 43-101F1 Technical Report Feasibility Study. Accessed September 13, 2014 at http://themacresourcesgroup.com/images/pdf/Definitive_Feasibility_Study_Copper_Flat_11_21_2013.pdf.

THEMAC 2012. THEMAC Resources – New Mexico Copper Corporation. July 2012. Mine Operation and Reclamation Plan. Copper Flat Mine Project. Sierra County, New Mexico.

THEMAC 2011. THEMAC Resources – New Mexico Copper Corporation. Copper Flat Mine Plan of Operations. December 2010, Revised June 2011.

Thompson and Hickey 2005. Thompson, W. and Hickey, J. 2005. Society in Focus. Boston, MA: Pearson.

TSR 2014. The Space Review, Jeff Foust. A Spaceport in Limbo. November 3, 2014. Accessed January 15, 2015 at http://www.thespacereview.com/article/2630/1

TRB 1994. Transportation Research Board. Highway Capacity Manual, Special Report 209, 3rd ed. 1994.

UMN 2001. University of Minnesota Extension. 2001. Soil Compaction: Causes, Effects, and Control. Available online at http://www.extension.umn.edu/distribution/cropsystems/components/3115s01.html

USBR 2015b. U.S. Bureau of Reclamation. Caballo Storage Report. El Paso Field Division Office. Accessed June 8, 2015 at http://www.usbr.gov/uc/elpaso/water/rgreports/faces/CaballoStorage.jsp.

USCB 2015. United States Census Bureau. Glossary Terms. Accessed January 15, 2015 at https://www.census.gov/glossary/.

USCB 2014. U.S. Census Bureau. 2014. Glossary. Accessed September 13, 2014 at https://www.census.gov/glossary/.

USCB 2013. United States Census Bureau, Population Division. Estimates of the Components of Resident Population Change: 2010 to 2013. Accessed January 15, 2015 at http://factfinder2.census.gov

USCB 2010. U.S. Census Bureau, American Community Survey. 2010. 2006-2010 Educational Attainment (S1501): Hillsboro CDP, New Mexico, Sierra County, Truth or Consequences (city). Accessed September 13, 2014 at http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_S1501&prodType=table.

USCB 2010a. U.S. Census Bureau, American Community Survey. 2010. Selected Economic Characteristics. 2010 American Community Survey 1-Year Estimates: New Mexico. Accessed July 30, 2012 at http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_1YR_DP03&prodType=table.

USCB 2010b. U.S. Census Bureau. 2010. State and County Quickfacts: New Mexico. Accessed July 10, 2012 at http://quickfacts.census.gov/qfd/states/35000.html.

USCB 2010c. U.S. Census Bureau. 2010. State and County Quickfacts: Sierra County, New Mexico. Accessed July 10, 2012 at http://quickfacts.census.gov/qfd/states/35/35051.html.

USCB 2010d. U.S. Census Bureau. 2010. State and County Quickfacts: Truth or Consequences (city), New Mexico. Accessed July 10, 2012 at http://quickfacts.census.gov/qfd/states/35/3579840.html.

USCB 2010e. U.S. Census Bureau. 2010. 2010 Demographic Profile Data. Hillsboro CDP, New Mexico. Accessed July 31 at http://factfinder2.census.gov/rest/dnldController/deliver?_ts=361844539677.

USCB 2010f. U.S. Census Bureau. 2010. 2010 Demographic Profile Data. Sierra County, New Mexico. Accessed July 31, 2012 at http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?fpt=table.

USCB 2010g. U.S. Census Bureau. 2010. 2010 Demographic Profile Data. Truth or Consequences city, New Mexico. Accessed July 31, 2012 at http://factfinder2.census.gov/rest/dnldController/deliver?_ts=361815757431.

USCB 2010h. U.S. Census Bureau. 2010. 2010 Demographic Profile Data. New Mexico. Accessed July 31, 2012 at http://factfinder2.census.gov/rest/dnldController/deliver?_ts=361815533344

USCB 2007. U.S. Census Bureau. 2007. 2007 County Business Patterns, Geography Area Series. County Business Patterns by Employment Size Class. CB0700A2. Accessed February 2015 at http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=BP_2006_00A2&prodType=table.

USCB 2006-2010. U.S. Census Bureau. 2006-2010. American Community Survey. Selected Economic Characteristics: Truth or Consequences city, New Mexico. Accessed July 31, 2012 at http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?fpt=table.

USCB 2006-2010a. U.S. Census Bureau. 2006-2010. American Community Survey. Selected Economic Characteristics: New Mexico. Accessed July 31, 2012 at http://factfinder2.census.gov/rest/dnldController/deliver?_ts=361820837873.

USCB 2006-2010b. U.S. Census Bureau. 2006-2010. American Community Survey. 2010. Selected Economic Characteristics: Hillsboro CDP, New Mexico. Accessed July 31, 2010 at http://factfinder2.census.gov/rest/dnldController/deliver?_ts=361845588743.

USCB 2006-2010c. U.S. Census Bureau. 2006-2010. American Community Survey. Selected Economic Characteristics: Sierra County, New Mexico. Accessed July 31, 2012 at http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_DP03&prodType=table.

USCB 2000. U.S. Census Bureau. 2000. Profile of General Demographic Characteristics: 2000. SF2 and SF3. Sierra County. Accessed July 30, 2012 at http://factfinder2.census.gov/rest/dnldController/deliver?_ts=361750202892.

USDA 2009. U.S. Department of Agriculture, Natural Resources Conservation Service. 2009. USDA Soils Data Mart. Accessed online November 2010 at http://soildatamart.nrcs.usda.gov/

USDA 2007. U.S. Department of Agriculture. 2007. Final Environmental Impact Statement, Highwood Generating Station.

USDA 2004. U.S. Department of Agriculture. Sound Recordings of Road Maintenance Equipment on the Lincoln National Forest, New Mexico. Accessed November 2012 at http://www.fs.fed.us/rm/pubs/rmrs_rp049.pdf.

USDA 1993. United States Department of Agriculture, Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. Available online at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/planners/?cid=nrcs142p2_054262

U.S. Army 2014. U.S. Army. Approved Jurisdictional Determination – Action No. SPA-2014-00364-LCO, Open Pit Water Body Inclusive of the 230 Acre Watershed at Copper Flat Mine in Sierra County, New Mexico.

U.S. Army 2007. U.S. Army. Army Regulation 200–Environmental Quality Environmental Protection and Enhancement.

USDHHS 2010. U.S. Department of Health and Human Services. 2010. The 2010 HHS Poverty Guidelines. Accessed July 31, 2012 at http://aspe.hhs.gov/poverty/10poverty.shtml.

USDI 1989. U.S. Department of Interior. Office of Surface Mining, Bureau of Mines. 1989. Report No. RI 8507. Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting.

USDOC 2012. United States Department of Commerce. 2012. Bureau of Economic Analysis. State Personal Income 2012: Definitions. Accessed July 10, 2012 at http://www.bea.gov/newsreleases/regional/spi/sqpi_newsrelease.htm.

USDOC 2010. United States Department of Commerce. 2010. Bureau of Economic Analysis, Regional Economic Accounts. Accessed July 15, 2012 at http://www.bea.gov/regional/index.htm.

USDOJ 2008. U.S. Department of Justice, Office of Justice Programs – Bureau of Justice Statistics. 2008. Census of State and Local Law Enforcement Agencies. Accessed September 13, 2014 at http://www.bjs.gov/content/pub/pdf/csllea08.pdf.

USEPA 2014a. U.S. Environmental Protection Agency. 2014. Air Data – Monitor Values Report. Accessed March 2014 at http://www.epa.gov/airdata/ad_rep_con.html.

USEPA 2014b. U.S. Environmental Protection Agency. 2014. The Green Book Nonattainment Areas for Criteria Pollutants. Accessed March 2014 at http://www.epa.gov/airquality/greenbook/anay_nm.html.

USEPA 2014c. U.S. Environmental Protection Agency. 2014. Class I Visibility Areas by State. Accessed March 2014 at http://www.epa.gov/visibility/class1.html.

USEPA 2014d. U.S. Environmental Protection Agency. 2014. State Implementation Plan Overview. Accessed March 2014 at http://www.epa.gov/airquality/urbanair/sipstatus/overview.html.

USEPA 2014e. U.S. Environmental Protection Agency. 2014. State Implementation Plans. Accessed March 2014 at http://www.epa.gov/reg5oair/sips/.

USEPA 2012. Environmental Protection Agency. 2012. Federal Register Volume 77, Number 5. Accessed June 2012 at http://www.gpo.gov/fdsys/pkg/FR-2012-01-09/html/2012-128.htm.

USEPA 2012a. U.S. Environmental Protection Agency. 2012. Memorandum Addressing Children's Health through Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act. Accessed September 13, 2014 at http://www.epa.gov/compliance/resources/policies/nepa/NEPA-Children's-Health-Memo-August-2012.pdf.

USEPA 2012b. U.S. Environmental Protection Agency. 2012. Basic Information: Air and Radiation. Accessed June 2012 at http://www.epa.gov/air/basic.html.

USEPA 2012c. U.S. Environmental Protection Agency. 2012. Basic Information about Copper in Drinking Water. Accessed June 2012 at http://water.epa.gov/drink/contaminants/basicinformation/copper.cfmWhat%20are%20EPA%27s%20drinking%20water%20regulations%20for%20copper?.

USEPA 2012d. U.S. Environmental Protection Agency. 2012. Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals. Accessed June 2012 at http://water.epa.gov/drink/contaminants/secondarystandards.cfm.

USEPA 2011. U.S. Environmental Protection Agency. 2011. National Pollutant Discharge Elimination System Stormwater Program. Available online at http://cfpub1.epa.gov/npdes/home.cfm?program_id=6.

USEPA 1999. U.S. Environmental Protection Agency. 1999. Final Guidance for Consideration of Environmental Justice in Clean Air Act 309 Reviews. Accessed September 13, 2014 at http://www.epa.gov/compliance/resources/policies/nepa/enviro_justice_309review.pdf.

USEPA 1999b. U.S. Environmental Protection Agency. 1999. Technologically Enhanced Naturally Occurring Radioactive Materials in the Southwestern Copper Belt of Arizona. USEPA 402/R-99/002. October 1999.

USEPA 1998. U.S. Environmental Protection Agency. 1998. Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses. Accessed September 13, 2014 at http://www.epa.gov/environmentaljustice/resources/policy/ej_guidance_nepa_epa0498.pdf.

USFS No Date. United States Forest Service. No Date. Gila National Forest. Accessed May 2012 at http://www.fs.usda.gov/main/gila/home.

USFS 2011. U.S. Forest Service. 2011. Draft Environmental Impact Statement for the Rosemont Copper Project. Accessed April 2013 at http://www.rosemonteis.us/files/deis/deis-ch3vol2.pdf.

USFS 2009. United States Forest Service. 2009. Ecological Subregions of the United States. Available online at http://www.fs.fed.us/land/pubs/ecoregions/toc.html.

USFS 2006a. United States Forest Service. 2006. Cibola National Forest – Annual Visitation Estimate. Accessed January 15, 2015 at http://apps.fs.usda.gov/nrm/nvum/results/A03003.aspx/Round2.

USFS, 2006b. United States Forest Service. 2006. Gila National Forest – Annual Visitation Estimate. Accessed January 15, 2015 at http://apps.fs.usda.gov/nrm/nvum/results/A03003.aspx/Round2.

USFS and MDEQ 2011. U.S. Forest Service and Montana Department of Environmental Quality. 2011. Supplemental Draft Environmental Impact Statement for the Montanore Project.

USFWS 2014a. U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (Coccyzus americanus); Final Rule. Federal Register, Vol. 79, No. 192. October 3.

USFWS 2014b. U.S. Fish and Wildlife Service. 2014. Official Species List. Project Name: Copper Flat Mine. New Mexico Ecological Services Field Office. May 9, updated November 3.

USFWS 2008. U.S. Fish and Wildlife Service. 2008. Chiricahua Leopard Frog (Rana chiricahuensis): Considerations for Making Effects Determinations and Recommendations for Reducing and Avoiding Adverse Effects. Southwest Endangered Species Act Team, New Mexico Ecological Services Field Office.

USFWS 2007. U.S. Fish and Wildlife Service. 2007. Chiricahua Leopard Frog (Rana chiricahuensis) Final Recovery Plan. Southwest Region, Albuquerque, NM. 149 pp. + Appendices A-M. April.

USFWS 2004. U.S. Fish and Wildlife Service. 2004. Effects of Oil Spills on Wildlife and Habitat. Available online at http://alaska.fws.gov/media/unalaska/Oil%20Spill%20Fact%20Sheet.pdf

USGS 2014. U.S. Geological Survey. 2014. Hydrologic unit map (based on data from USGS Water-Supply Paper 2294). Accessed September 2014 at <http://water.usgs.gov/GIS/regions.html>. Last modified on March 5, 2014.

USGS 2009. U.S. Geological Survey. 2009. National Elevation Dataset: 1 arc-second. Accessed online at <http://seamless.usgs.gov>.

USGS 2004. U.S. Geological Survey. 2004. Southwest Regional Gap Analysis Project ‘Provisional’ Landcover and Related Datasets. Available online at http://earth.gis.usu.edu/swgap/.

USGS 1987. United States Geological Survey. 1987. Mineral Resources of the Jornada del Muerto Wilderness Study Area, Socorro and Sierra Counties, New Mexico. Accessed May 2012 at http://pubs.usgs.gov/bul/1734a/report.pdf.

Vinson 2014. New Mexico Department of Natural Resources. 20 June, 2014. (Email communication) Joe Vinson, Reclamation Specialist/Soil Scientist.

Walstad et. al 2010. Walstad, W. B.; Rebeck, K.; and McDonald, R.A. “The Effects of Financial Education o the Financial Knowledge of High School Students.” Journal of Consumer Affairs 44.3 (2010): 483-498: 337.

Wilderness.Net 2012. Gila Wilderness. Accessed May 2012 at http://www.wilderness.net/index.cfm?fuse=NWPS&sec=wildView&WID=205&tab=Gene.

Williams Advanced Materials. No date provided. Material Safety Data Sheet: Gold (WG-0035). Accessed June 2012 at http://www.clean.cise.columbia.edu/msds/gold.pdf.

Williams, D.J.; Currey, N.A.; Ritchie, P.; and Wilson, G.W. 2003. Kidson Waste Rock Dump Design and “Store and Release” Cover Performance Seven Years On, 6th International Conference on Acid Rock Drainage, Cairns, Australia.

Wilson, C.; White, R.; Orr, B.; Roybal, R.G. 1981. Water Resources of the Rincon and Mesilla Valleys and Adjacent Areas, New Mexico. New Mexico State Engineering Technical Report No. 43.

Younger, P.L.; Banwart, S.A.; and Hedin, R.S. 2002. Mine Water, Hydrology, Pollution, Remediation, Kluwer Academic Publishers, Dordrecht.

Ziegler, K.E., Ph.D., Ziegler Geologic Consulting, LLC. 2015. *New Mexico Copper Corporation Copper Flat Project: Paleontology Resource Survey Summary Report.* April 9, 2015.

Zouhar, K. 2003. Tamarix spp. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service. Available online at http://www.fs.fed.us/database/feis/plants/tree/tamspp/all.html.

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GLOSSARY

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Air-Quality Control Region: A contiguous area where air quality is relatively uniform. AQCRs may consist of two or more cities, counties or other governmental entities, and each region is required to adopt consistent pollution control measures across the political jurisdictions involved.

Alkali sinks: A sunken area of land where the soil is strongly impregnated with alkalis, which are destructive to vegetation.

Allotment (range): A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under management of an authorized agency. An allotment generally consists of Federal rangeland, but may include intermingled parcels of private, State, or Federal land. BLM stipulates the number of livestock and season of use for each allotment.

Alluvial valley: Valley filled with stream deposit.

Ambient: The natural surroundings of a location.

Amenity migration: The movement of people based on the draw of natural or cultural amenities.

Animal unit: A unit of measure for rangeland livestock equivalent to one mature cow or five sheep or five goats, all over 6 months of age. An animal unit is based on an average daily forage consumption of 26 pounds of dry matter per day.

Animal unit month (AUM): A standardized unit of measurement of the amount of forage necessary for the complete sustenance of one animal unit for a period of one month; also, a unit of measurement of grazing privileges that represents the privilege of grazing one animal unit for a period of one month.

Area of potential effect: The area of potential effect (APE) is the geographic area within which an undertaking (i.e., project) may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.

Attainment area: A region within which the level of a pollutant is considered to meet the National Ambient Air Quality Standards.

A-weighted decibel: Decibel measurement on the "A-weighting" scale. A decibel adjusted (weighted) to reflect the relative loudness of sounds most sensitive to human ears.

Best Management Practice (BMP): Method that has been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources, including construction sites. They also help prevent or mitigate other safety and environmental issues.

Breccia pipe: A chimney-like structure filled with angular rock fragments.

Cash and cash equivalents: The most liquid assets found within the asset portion of a company's balance sheet. Cash equivalents are assets that are readily convertible into cash, such as money market holdings, short-term government bonds or Treasury bills, marketable securities, and commercial paper.

Cash trust fund: A fund set up by a company in an amount that is determined to be sufficient to cover specific reclamation costs which are contained in the decommissioning plan. The fund amount will be a function of the expected annual reclamation costs, investment policy, and expected real rates of return.

Change house: Building where mine workers change into work clothes, also known as “the dry.”

Civilian labor force: The sum total of those currently employed and unemployed.

Codominant: Being one of two or more of the most common or important species in an ecological community.

Colluvium: A thin layer of soil and debris.

Contamination: The introduction into water, air, and soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use.

Copper ad valorem: Extractive industries are subject to the copper ad valorem tax for operating mines. The copper ad valorem tax is dependent upon: 1) the value of the mine and all real and personal property and; 2) the value of salable minerals.

Criteria pollutants: Six primary air pollutants found throughout the United States as defined by USEPA pursuant to the Clean Air Act. They are particulates, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead.

Cultural resources: Cultural resources are physical manifestations of culture, specifically archaeological sites, architectural properties, ethnographic resources, and other historical resources relating to human activities, society, and cultural institutions that define communities and link them to their surroundings.

Day-Night Average Sound Level: The A-weighted equivalent sound level for a 24-hour period with an additional 10 dB imposed on the equivalent sound levels for night time hours of 10 p.m. to 7 am.

Decibel: A unit used to express the intensity of a sound wave, equal to 20 times the common logarithm of the ratio of the pressure produced by the sound wave to a reference pressure, usually 0.0002 microbar.

Discountable Effects: Effects that are extremely unlikely to occur. This term was developed by USFWS for analyzing effects to biological resources.

Equivalent sound level: Quantifies the noise environment as a single value of sound level for any desired duration.

Forb: An herbaceous flowering plant other than grasses.

Full-time equivalent (FTE): One person working full-time for 1 year or 2,080 hours.

General Head Boundary: Model boundary across which flow can occur based on the difference in head between the model cell next to the boundary and reference level at the boundary.

Graben: A depressed block of land bordered by parallel faults.

Grama: Any of several pasture grasses (genus *Bouteloua*) of the western United States.

Graminoids: Grasses, herbaceous plants with narrow leaves growing from the base.

Grazing: Consumption of native forage on rangeland or pastures by livestock or wildlife.

Grazing allotment: An area where one or more livestock operators graze their livestock. An allotment generally consists of Federal land but may include parcels of private or State-owned land.

Grazing permit: An authorization that allows grazing on public land. Permits specify class of livestock on a designated area during specified seasons each year. Permits are of two types: preference (10 years) and temporary nonrenewable (1 year).

Greenhouse gas: Any gas, such as carbon dioxide or chlorofluorocarbons (CFCs), that contributes to the greenhouse effect when released into the atmosphere.

Hazards training: Per 30 CFR 48.31, instruction on hazard recognition and avoidance; emergency and evacuation procedures; health and safety standards, safety rules, and safe working procedures; self-rescue and respiratory devices; and such other instruction as may be required by the Mine Safety and Health Administration District Manager based on circumstances and conditions at the mine.

Hertz: A unit of frequency equal to 1 cycle per second.

Historic properties: Historic properties are cultural resources that meet the criteria for listing on the NRHP.

Inhalable fraction: Portion of dust cloud capable of being breathed in via nose and mouth.

Invasive species: Non-native species that tend to spread prolifically and undesirably or harmfully.

Letter of credit: An agreement between a banking institution and a company whereby the bank will provide cash funds to a third party (the beneficiary, which in this case would be the government), under specific terms contained in the letter of credit.

Lineament: A distinctive line or contour.

Make-up water: Water supplied to compensate for loss by evaporation and leakage.

Material Safety Data Sheet (MSDS): Sheets that contain safety information about a chemical or material including necessary protective equipment and safety precautions, such as reactivity.

Mesa: An isolated flat-topped hill with steep sides, found in landscapes with horizontal strata.

Meters: The international standard unit of length, approximately equivalent to 39.37 inches.

National Ambient Air Quality Standards: Standards established by the USEPA that apply to outdoor air throughout the country. Primary standards are designed to protect human health, with an adequate margin of safety, including sensitive populations such as children, the elderly, and individuals suffering from respiratory disease.

National Register of Historic Places: The National Register of Historic Places (NRHP) is a listing maintained by the Federal government of prehistoric, historic, and ethnographic buildings, structures, sites, districts, and objects that are considered significant at a Federal, State, or local level. Listed resources can have significance in the areas of history, archaeology, architecture, engineering, or culture. Resources that are listed on the NRHP, or have been determined eligible for listing, have been documented and evaluated according to uniform standards, and have been found to meet criteria of significance and integrity.

Net smelter returns royalty: Charged as a percentage of the mineral's gross value, or the production volume multiplied by the price per pound. The State does permit mining companies to deduct costs associated with transportation and processing costs from royalty payments, but not mineral extraction costs. The Commissioner decides the royalty rates on a case by case basis; however, the rate cannot be less than 2 percent.

Nonattainment areas: A region where air pollution levels persistently exceed National Ambient Air Quality Standards.

Noxious weeds: Invasive plant species that has been designated by county, State, or Federal government.

Order of magnitude: A fixed ratio between sets of numbers or amounts. The common order of magnitude is 10, meaning an order of magnitude is 10 times something else and something that is two orders of magnitude is 100 times another item.

Other property income: Represents property income minus proprietor income. It includes corporate profits, capital consumption allowance, payments for rent, dividends, royalties, and interest income. It may also be referred to as "other property type income".

Payment in lieu of taxes: A program whereby the local government or municipality is compensated foregone property tax revenue due to the nature of ownership or use of a particular piece of real property (e.g. land, right-of-way).

Per capita personal income: This measure of income is calculated as the total personal income of the residents of an area divided by the population of the area. Per capita personal income is often used as an indicator of the quality of consumer markets and of the economic well-being of the residents of an area.

Performance bond: A bond issued to one party of a contract as a guarantee against the failure of the other party to meet obligations specified in the contract. Under the performance bond agreement, the insurer agrees to act as surety for the company and makes a commitment to be financially responsible for all claims and expenses arising out of the (in this case) decommissioning plan up to a certain limit.

Permissible exposure limit: The legal limit of employee exposure to a chemical or physical agent established by Occupational Safety and Health Administration.

Permitted livestock use: The forage allocated by, or under the guidance of, an applicable land use plan for livestock grazing in an allotment under a permit or lease and expressed in AUMs.

Playas: An area of flat, dried up land, esp. a desert basin from which water evaporates quickly.

Perennial plants: A plant that that lives for more than 2 years.

Personal current transfer receipts: Payments consisting of transfer payments by persons to government and to the rest of the world. Payments to government include donations, fees, and fines paid to Federal, State, and local governments, formerly classified as "personal nontax payments."

PM_{10}: Particulate matter less than 10 microns in diameter.

$PM_{2.5}$: Particulate matter less than 2.5 microns in diameter.

Programmatic Agreement: A Programmatic Agreement is a document developed to memorialize the measures that would be implemented to avoid, minimize, or mitigate adverse effects that would occur to historic properties as the result of an undertaking. Such measures are normally developed by the lead Federal agency in consultation with the SHPO, ACHP, the project proponent, interested Tribes, and the interested public.

Raised fault block: Very large blocks of rock, sometimes hundreds of kilometers in extent, created by tectonic and localized stresses in the Earth's crust.

Reagent management: The management of a substance or compound that is added to a system in order to bring about a chemical reaction, or added to see if a reaction occurs.

Resources Excise Tax Act: Consists of three taxes (resources, processors, and services) on activities related to natural resources in New Mexico. The first tax, the "resources tax" is imposed if the entity is the owner of the land where the extracting is taking place. The second, the "processors tax" applies if the entity owns the land and is processing hard minerals. The third, the "services tax" applies to the entity severing or processing natural resources if it is not the owner of the natural resources. The service charge is the total amount of money or the reasonable value of other consideration received for severing or processing any natural resource.

Respirable fraction: Dust that can penetrate into the gas-exchange region of the lungs.

Right-of-Way: The legal right, established by usage or grant, to pass along a specific route through grounds or property belonging to another. The public land the BLM authorizes a holder to use or occupy under a grant.

Runoff: The non-infiltrating water entering a stream or other conveyance channel shortly after a rainfall.

Sediment: Particles derived from rock or biological sources that have been transported by water.

Severance tax: A tax imposed on the privilege of removing of nonrenewable natural resources. Severance tax is charged to producers, or anyone with a working or royalty interest, for operations in the imposing States.

Short ton: A unit of mass equal to 2,000 pounds.

Solvency: The ability of a company to meet its long-term financial obligations. Solvency is essential to staying in business, but a company also needs liquidity to thrive.

State Implementation Plan: The State plan for complying with the Federal Clean Air Act. A SIP consists of narrative, rules, technical documentation, and agreements that an individual State will use to clean up areas not meeting the National Ambient Air Quality Standards.

Surety bond or Surety: A promise to pay one party (the obligee) a certain amount if a second party (the principal) fails to meet some obligation, such as fulfilling the terms of a contract. The surety bond protects the obligee against losses resulting from the principal's failure to meet the obligation.

Tangible asset: Assets that have a physical form. Tangible assets include both fixed assets, such as machinery, buildings and land, and current assets, such as inventory.

Threshold limit value: The level below which it is believed that a worker's exposure daily over a career would have no adverse health effects based on available research.

Time-weighted average: Average exposure over a unit of time (often 8 hours), meaning periods of exposure may exceed this amount if average is at or below the specified level.

Unemployment rate: The number of unemployed persons divided by the labor force, where the labor force is the number of unemployed persons plus the number of employed persons.

Volcanic basalts: A common extrusive igneous rock formed from the rapid cooling of basaltic lava exposed at or very near the surface.

Warm season grasses: Grasses that go dormant in the winter in mild climate areas. They normally will not grow in cold winter areas.

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